BERCHTOLD

OPERON® D 850
SERVICE & PARTS MANUAL

SERVICE AND PARTS MANUAL

Related Publications:

OPERON D 850 Installation and Operator Manual 700000121

OPERON D 850 Uncrating Instructions 700000122

The service and parts manual is meant to be used as a reference in performing preventative and corrective maintenance on the OPERON D 850 Surgical Table. The successful completion of a factory training program is required to properly and effectively troubleshoot, repair, and maintain the OPERON D 850 Surgical Table.

BERCHTOLD Corporation assumes no liability for table performance when used with accessories designed by others for use on the OPERON D 850 Surgical Table or damage to the OPERON D 850 Surgical Table resulting from the use of accessories designed by others.

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IMPORTANT -
THE SAFETY INSTRUCTIONS THAT FOLLOW APPEAR WITHIN THE MANUAL. READ THEM CAREFULLY BEFORE OPERATING THE UNIT AND FOLLOW INSTRUCTIONS.

SPECIAL SAFETY INSTRUCTIONS

SAFETY SYMBOLS

This manual uses special symbols to help alert you to important safety information:

*This symbol identifies a **WARNING**. A warning indicates that the procedure in the following text involves actions that could cause harm or death to an individual if certain precautions are not taken. The warning text always provides specific information on what you must do to avoid the risk.*

*This symbol identifies a **CAUTION.** A caution indicates that the procedures in the following text involve actions that could cause damage to the equipment, including the failure to operate. The caution text always provides specific information on what you must do to avoid the risk.*

*This symbol identifies a **NOTE**. A note contains information that can help you perform the procedure in the following text more effectively.*

USE CONDITIONS

***WARNING** — POSSIBLE EXPLOSION HAZARD: **Do not operate the table in the presence of flammable anesthetics.** The **OPERON D 850** table is designed for use in non-hazardous anesthetizing locations.*

POWER SUPPLY

***WARNING** — ELECTRICAL HAZARD: Repeated breaker tripping or fuse replacement may indicate a ground fault or overload condition. The table will not operate reliably under such a condition and may be electrically unsafe. Do not use the table until this condition is corrected.*

LOAD CAPACITY

In normal orientation, this table has a patient lifting and articulation capacity of 1000 lb (453 kg). In reverse orientation, this table has a patient lifting and articulation capacity of 500 lbs (227 kg). Positioning and constraints are discussed on page S-9. Do not exceed this maximum load in service. See *Figure 1-1.*

***WARNING** — Overloading may result in tipping of the table or failure of the table sections to move. Do not exceed the maximum load in service.*

***NOTE** — The use of some positioning capabilities or table accessories will put additional restrictions on patient weight. Accessories provided by Berchtold Corp., when used as intended, are designed to perform safely with the patient loads for which this table was designed. A Berchtold Corporation accessory that puts additional restrictions on patient weight, when used as intended, will be clearly labeled to indicate the maximum allowed loads.*

The table load capacity is 400 lb (181 kg) when the beach chair accessory is installed on the table.

PINCH POINTS

***WARNING** — Cutting or crushing injury may occur if any part of a patient or staff member is caught in a pinch point when the table is articulated.*

***CAUTION** — Damage to the table or object may occur if any foreign object is caught in a table pinch point when the table is articulated.*

Due to the variety of table positions attainable with the **OPERON D 850** table, pinch or crushing points exist (Ref. Figure S-1). The OR staff must be trained to ensure that body parts or surgical apparatus are not caught in pinch points when the table is operated.

This list is not all-inclusive, because pinch points can be created by the attachment of accessories. Always ensure that the patient and staff are clear of all pinch points before moving the table or while the table is in motion.

Pinch points include but are not limited to:

1. Kidney elevator to seat top
2. Kidney elevator to seat channels
3. Kidney elevator to back section
4. Headrest to back section
5. Back / Leg section link to seat channel
6. Side shields to column shields (in tilt)
7. Column shields to base cover
8. Base to floor
9. Floor feet to base
10. Floor feet to floor
11. Leg section to column shield
12. Foot pump handle to floor
13. Back Section to seat top.

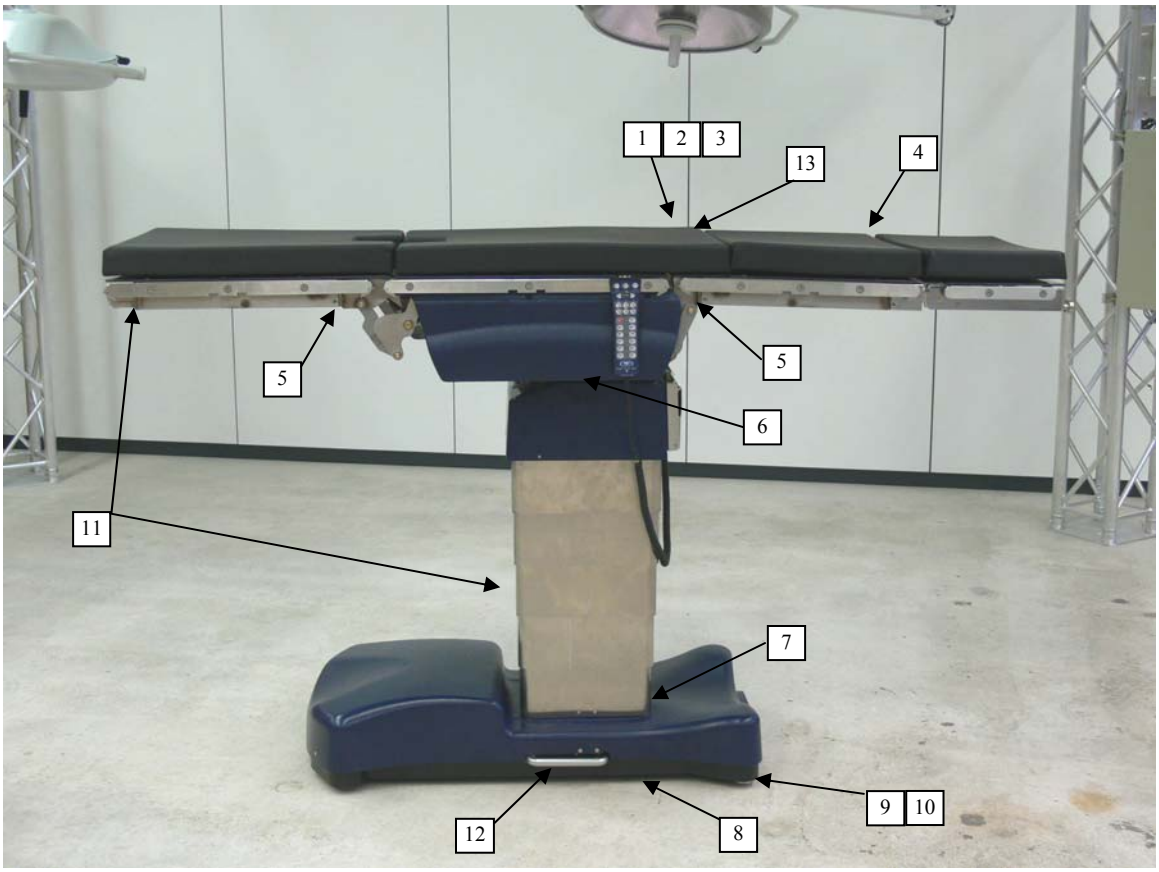


Figure S-1 Pinch Points

PATIENT POSITIONING

WARNING — POSSIBILITY OF TIPPING: *Table stability may be compromised if patients are positioned beyond the following limits:*

The patient's pelvis should not be extended beyond the end of the seat section. The patient's legs may be placed on a leg extension attached to the end of the leg section.

WARNING — POSSIBILITY OF TIPPING: If FULL SLIDE FORWARD IS REQUIRED, *the patient's pelvis must always be located over the seat section when in normal orientation. Utilizing full forward slide while the patient's pelvis is on the leg section can impair table stability and result in patient injury or equipment damage.*

WARNING *— The leg section may be removed from the table. If it is left on the table, use caution when raising the leg section while the patient is in the normal perineal position.*

WARNING *— The back section may be removed from the table.*

Full articulation and full slide in either direction can be safely achieved with a 1000lb (453g) patient if these steps are followed.

OPERATION

WARNING*— The table should always be locked to the floor whenever a patient is on the table or being transferred to or from the table. This is accomplished by extending the table's feet by activating the FLOOR LOCK function. This table is not intended for patient transport.*

WARNING— Weight Limit in reverse, while not recommended, it is possible to place a patient in reverse orientation. Patient weight must not exceed 500 lbs. when placed in reverse.

CAUTION *— Storage of clamps, accessories, etc., on the base cover may result in damage to lift column shields and prevent proper elevation or descent of the table.*

TABLE MOVEMENT WITH PATIENT

WARNING *— If the table needs to be moved with a patient on the table, it is very important to follow the following instructions to prevent patient injury or equipment damage.*

WARNING *— The table should not be used to transport a patient over a long distance. This procedure is only meant for repositioning the table in the surgical suite.*

PRIMARY HAND PENDANT FUNCTIONS

AUXILIARY HAND PENDANT

WARNING *— The auxiliary hand pendant functions will operate regardless of whether the floor feet are locked or unlocked. If the floor feet are unlocked, the table may roll when the manual pump is operated.*

CAUTION *— The auxiliary hand pendant does not have the following functions: FLEX, REFLEX, CHAIR, RETURN TO LEVEL, UROLOGY, or SLIDE. This pendant is intended to be used for completing procedures, followed by charging the batteries or servicing the table.*

WARNING *— When using the auxiliary pendant, the software controlled limits are not active. DAMAGE MAY OCCUR. Review the user controlled limits section of this manual.*

HEADREST

WARNING *— Do not mount knee crutches or leg holders to the headrest side rail. The headrest should only be used for supporting the head or feet. Do not lean on the headrest. The headrest has a weight limit of 50 lbs.*

WARNING *— When articulating the headrest, be sure that the locking mechanism engages completely, and does not hang in between positions. Until the locking mechanism engages, the headrest may move when a load is applied.*

WARNING — *When releasing the locking mechanism, support the headrest, as it will fall freely if the locking mechanism is not engaged.*

REMOVABLE LEG SECTION

WARNING *— Failure to securely lock the leg section into place may result in patient injury. Always check the retention of the leg section upon installation.*

REMOVABLE BACK SECTION

WARNING *— Failure to securely lock the back section into place may result in patient injury. Always check the retention of the leg section upon installation.*

ACCESSORIES DESIGNED BY OTHERS

Berchtold Corporation assumes no liability for table performance when used with accessories designed by others for use on Berchtold equipment, or damage resulting to Berchtold equipment resulting from the use of accessories designed by others.

RADIOLUCENT TABLE TOP AND PADS

CAUTION *— The anti-static properties of the table depend on the use of the recommended mattress. Compromise of the anti-static properties could expose the patient or OR personnel to an electrostatic shock. It could also deliver a shock to the table's electronics that could damage or destroy critical components.*

CAUTION *— Protect the top and bottom surfaces from nicks and scratches. Scratches more than 0.005 inches (127 microns) deep may appear on x-rays. Damaged or scratched panels should be replaced if x-ray quality is affected.*

FOOTSWITCH

CAUTION *— The Footswitch's electrical connections are resistant to fluid intrusion, but if fluid drainage is anticipated, the footswitch should be protected by wrapping it with a clear disposable footswitch bag. This will reduce the need to disinfect the footswitch.*

HYDRAULIC SYSTEM

WARNING *– POSSIBILITY OF INJURY: The hydraulic system must be kept free of contamination. Contamination can cause the hydraulic system to fail, resulting in personal injury or equipment damage.*

CAUTION *– The hydraulic system on the OPERON D 850 surgical table contains micro-hydraulic valves, which are very sensitive to contamination. Only a qualified, trained service technician should open the hydraulic system, and only after all other repair procedures have been tried. Always use clean tools, and cover or wrap any loose hydraulic lines with clean plastic bags.*

HYDRAULIC HOLLOW PLUGS

CAUTION *– Do not over tighten the hollow plugs. Over tightening can cause the seals to deform and leak.*

CAUTION *— Hollow plugs used in the hydraulic system have different torque values than the mechanical fasteners. See Table 4-1 for hollow plug torque requirements.*

HYDRAULIC FLUID

CAUTION – Do not mix hydraulic fluid types. Other hydraulic fluids can be incompatible with the seals in the OPERON D 850 table and can cause equipment failure or reduce the service life. (See drawing 306762 for correct fluid designation.)

ELECTROMAGNETIC INTERFERENCE

WARNING *— When using the table in the vicinity of high-frequency surgical equipment, such as cardiac defibrillators and cardiac defibrillator monitors, refer to the equipment manufacturers' instructions to ensure compatibility issues are considered.*

WARNING *— When using the table in the vicinity of neuro-diagnostic monitoring equipment, interference may appear on the monitoring device. To eliminate this, set the BACKLIGHT TIMER to 1 sec using the service software*

ELECTRICAL SYSTEM

WARNING – *When servicing the table, turn power off or remove the appropriate fuses to prevent personal injury. If power is required, use care to avoid contact with live parts.*

WARNING – *Even a "dead" battery can contain enough power to cause a serious shock or explosive spark. Always disconnect the battery charger plug at the power center before disconnecting cables.*

WARNING – *The batteries contain acid, which can cause serious burns. While the batteries are sealed, a dead battery may be damaged and may leak. Always handle batteries in a way that will prevent acid from spilling on your skin or clothes.*

CLEANING AND DISINFECTION

WARNING *— Unplug the power cord before cleaning the table if cleaning liquids will be used near the power cord receptacle. Under no circumstances should steam or extremely hot water (over 150°F/66°C) be used to disinfect or clean the table. Elevated temperatures and high humidity will weaken the hydraulic lines and result in failure of the hydraulic system and increased leakage currents. Do not clean this table in automatic cart washing equipment. Use of high-pressure water guns could lead to an electrical malfunction and must be avoided.*

CAUTION *— Failure to thoroughly dry the surface after cleaning may result in rust.*

WARNING — Always replace fuses with fuses of the same voltage and current rating. Failure to use the correct fuse could cause a fire and injury to the patient or hospital personnel.

WARNING LABELS

Figure S-2 shows the patient safety warning label attached to the table. The label is located on the base at the foot end.

TIPPING PATIENT SAFEGUARDS
• MAX SAFE WORKING LOAD 1000 LBS (453 KG) IN ALL ARTICULATIONS
• DO NOT PLACE PATIENT ON TABLE UNLESS FLOOR LOCKS ARE ENGAGED
• DO NOT TRANSPORT A PATIENT ON THE TABLE. SEE THE OPERATOR MANUAL FOR INSTRUCTIONS ON SAFELY MOVING TABLE WITH PATIENT
• DO NOT EXCEED 400lb PATIENT WEIGHT WITH BEACH CHAIR ACCESSORY
• DO NOT EXCEED 300lb PATIENT WEIGHT WITH FRACTURE ATTACHMENT ACCESSORY
• CAUTION: DAMAGE TO TABLE IS POSSIBLE AS ACCESSORIES ARE STORED ON THE BASE
WARNING
GENERAL PATIENT SAFEGUARDS
• BEFORE USING THE SURGICAL TABLE READ AND THOROUGHLY UNDERSTAND THE OPERATOR MANUAL
• HEALTH CARE PROFESSIONALS MUST INSURE PATIENT IS PROPERLY POSITIONED AND MONITORED TO PROTECT PATIENT
• PROTECT PATIENTS FROM PINCH POINTS. REFER TO THE OPERATOR MANUAL FOR PINCH POINT LOCATIONS
• INSTALL AND TIGHTEN ALL ACCESSORIES ACCORDING TO INSTRUCTIONS. DO NOT USE DAMAGED OR WORN ACCESSORIES
EXPLOSION HAZARD
DO NOT OPERATE THE TABLE IN PRESENCE OF FLAMMABLE ANESTHETICS
WARNING
WEIGHT CAPACITY 1000 lbs/435 kg
(REVERSE ORIENTATION 500 lbs/218 kg)

Figure S-2 Patient Safety Warning Labels

Figure S-3 Serial Number and Regulatory Approval Labels

GENERAL INFORMATION

GENERAL DESCRIPTION

The Berchtold OPERON D 850 surgical table is a remote controlled, full-function design offering a high level of patient positioning and imaging flexibility to the surgical team. The table can be activated by AC power through the power cord (input range of 115V ±10%) or by battery power, which requires no power cord except when charging the batteries.

An electric motor with a belt driven screw is used to slide the table top head to foot.

Hydraulic cylinders are used to articulate the table's sections. Hydraulic pressure is provided by a motor driven pump during normal use, and by a manual foot pump in manual back-up mode.

A hand-held control pendant is used to control table positions.

The tabletop is divided into the following sections:

- Headrest
- Back Section
- Kidney Elevator
- Seat Section
- Leg Section

A leg extension can be added to extend the tabletop surface.

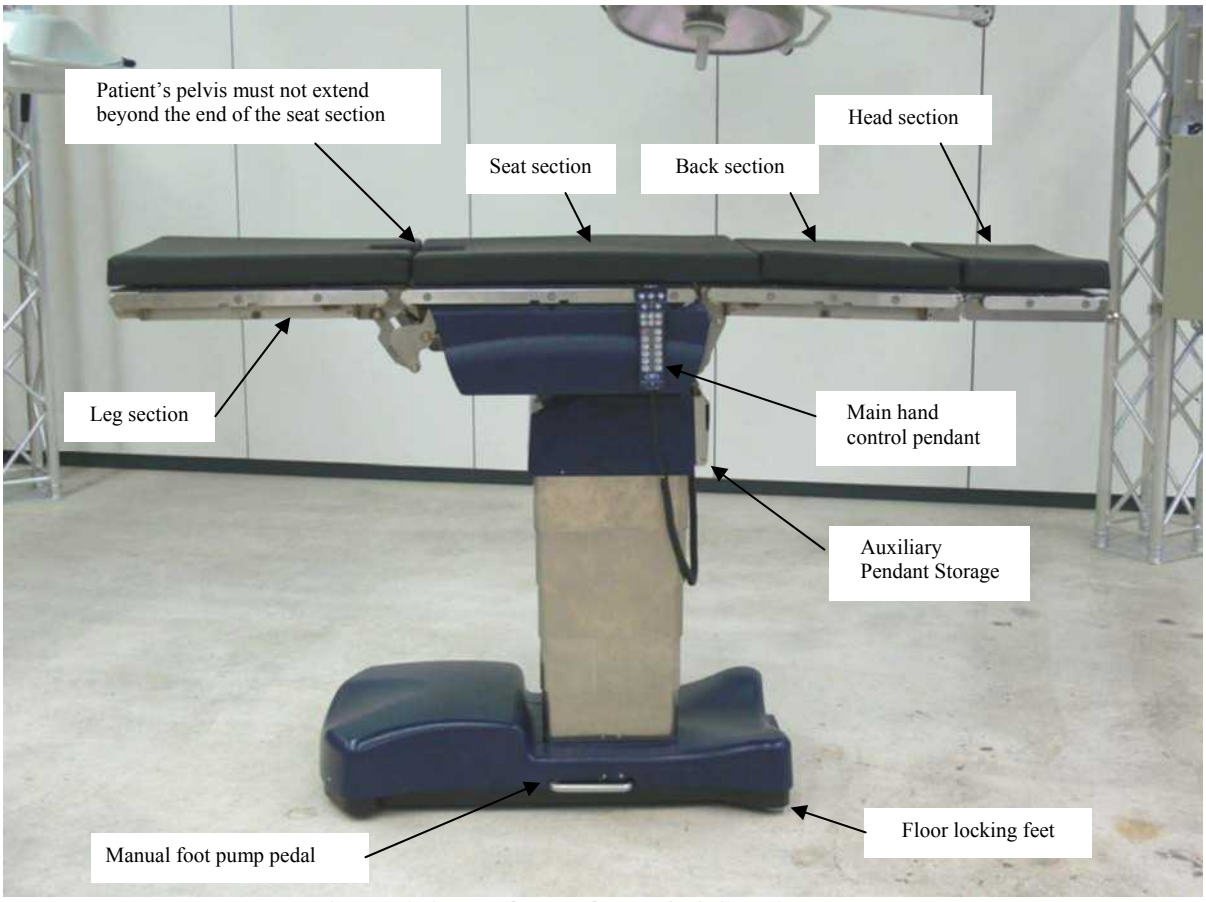


Figure 1-1 OPERON D 850 Surgical Table

RADIOLUCENT TABLE TOP AND PADS

CAUTION *— The anti-static properties of the table depend on the use of the recommended mattress. Compromise of the anti-static properties could expose the patient or OR personnel to an electrostatic shock. It could also deliver a shock to the table's electronics that could damage or destroy critical components.*

The tabletop surface is made from electrically conductive radiolucent panels. The table is fitted with a matching set of conductive radiolucent pads. Velcro tape holds the pads in place.

CAUTION *— Protect the top and bottom surfaces from nicks and scratches. Scratches more than 0.005 inches (127 microns) deep may appear on x-rays. Damaged or scratched panels should be replaced if x-ray quality is affected.*

Each table section has a cassette channel that can accommodate x-ray cassettes up to 14" x 17" (356 x 432 mm).

INTERCHANGEABLE HEADREST

The headrest can be attached to the seat section to allow for positioning the patient toward the leg end of the table.

POWER SUPPLY

WARNING *— Repeated breaker tripping or fuse replacement may indicate a ground fault or overload condition. The table will not operate reliably under these conditions, and may be electrically unsafe. Do not use the table until these conditions are corrected.*

NOTE *— Recharge the batteries as indicated by the battery indicator on the control pendant. For longevity, it is good practice to charge the batteries at least once a week*

The locations of the primary Power Supply components are shown in Figure 1-2.

When the table is plugged into a 120VAC receptacle, it is powered by AC (mains). When the power cord is not plugged in, the batteries provide power to the table. In either case, the ON/OFF switch on the base must be ON to articulate any table sections. When the ON/OFF switch on the base is OFF, the table's electronics and pump motor are isolated from the power supply and the batteries, regardless of the pendant used.

When the charge indicator lamp near the power cord receptacle is lit, the table senses AC power and activates the battery charging system. If AC is present, the battery charging system is activated whether the ON/OFF switch on the base is in the ON or OFF position. The table can remain plugged into AC indefinitely without damaging the batteries. The battery indicator on the primary hand pendant displays the battery charge status. This display has three sections: green (full charge), yellow (low charge), and red (recharge). Only one color will be activated at a time.

NOTE *— In the unlikely event of a control pendant failure, the table movements can be stopped by switching the breaker on the base to the off (down) position.*

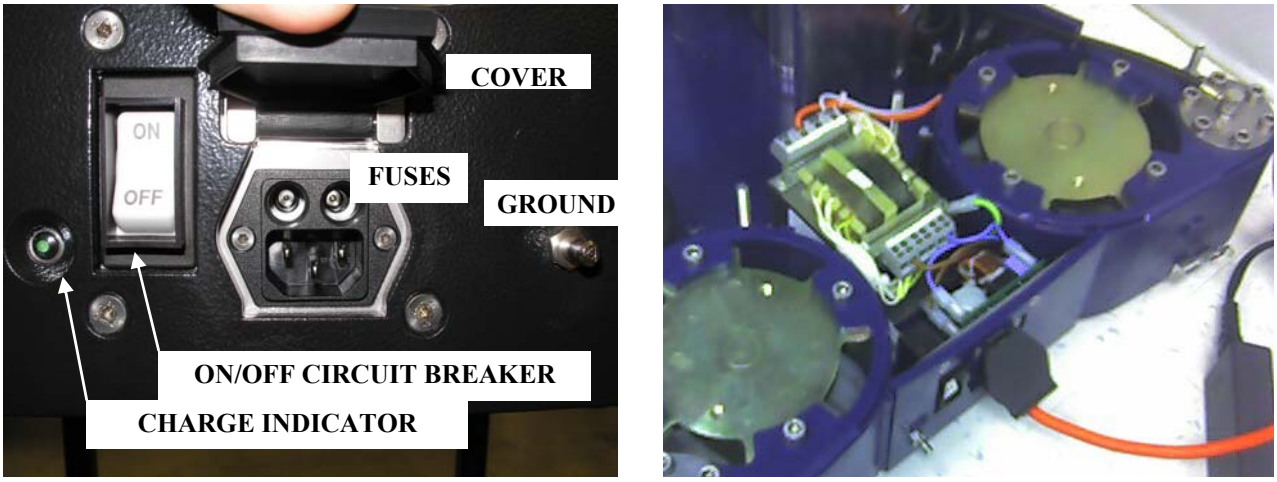


Figure 1-2 Power Center Components

FLOOR LOCK SYSTEM

Four self-stabilizing floor feet compensate up to 0.25" (6 mm) for uneven floors. The floor feet can be lowered (locked) or raised (unlocked) using the control pendant. When the floor feet are raised, the table rests on four non-conductive casters.

FUSES

Fuses are accessible without removing the base covers.

They are located within the receptacle for the power cord, contains two fuses. These fuses protect against current surges in the AC (mains) line.

In addition to the fuses, the ON/OFF switch serves as a circuit breaker with a 20 Amp rating.

See Figure 1-2 for the fuse locations**.**

PRIMARY HAND PENDANT

A primary hand pendant controls all table functions. The floor feet must be locked by activating the FLOOR LOCK function to operate any other pendant functions. This ensures that the table base will not move while the tabletop is articulating.

The primary hand pendant plugs into the PATIENT LEFT side of the remote control connector box, which is located on the head end of the column beneath the table top. Insert the pendant so the red dot on the connector aligns with a red dot on the socket in the Primary Hand Pendant Connector Box.

NOTE

***NOTE** — The ON/OFF function on the control pendant can be used to stop the table while in motion.*

AUXILIARY HAND PENDANT

The Auxiliary Hand Pendant is identical to Primary Hand Pendant and can be used as a replacement for a failed Primary Hand Pendant. To replace the Primary Hand Pendant, unplug it from the Primary Pendant receptacle and plug in the Auxiliary Pendant. The Auxiliary Hand Pendant will now have all of the functions and indicators of the Primary Hand pendant.

PRIMARY HAND PENDANT INDICATORS

See Figure 1-3 for the location of the indicators

1. **AUX. PENDANT** (amber flashing) — Auxiliary hand pendant is active. The primary hand pendant will be disabled if the auxiliary hand pendant is active.
2. **SERVICE (red) —** Table malfunction. It is likely that most of the functions still work properly and can still be controlled from the primary hand pendant. If the control pendant is not working, use the auxiliary hand pendant and the manual foot pump (if necessary) to articulate the table until the malfunction can be repaired.

NOTE

***NOTE** — If the SERVICE indicator lights, call your local Berchtold Corporation Service Representative.*

3. **TABLE LIMIT (amber flashing)** — Indicates that the movement commanded has reached a software controlled limit to avoid damage to the table components.
4. **POWER (green)** – hand pendant is active. Backlight may or may not be lit.
5. **FLOOR UNLOCK (amber)** — Floor feet are raised so table is mobile.
6. **FLOOR LOCK (amber) —** Floor feet are lowered so table is locked in place.
7. **SPEED ADJUST HI (green) –** articulation speed of all functions is set to normal.
8. **SPEED ADJUST LO (green)** – articulation speed of all functions is set to low.
9. **BATTERY —** LEDs indicate the charge status of the batteries:
   - Green — Full to medium charge. Normal Operation.
   - Yellow — Low charge. Table still operates normally, but batteries should be charged at the first opportunity.
   - Red (steady) — Recharge battery. Pump motor is shut off and manual foot pump must be used.
   - Red (flashing) — Auxiliary pendant must be used. Recharge battery immediately!

NOTE

***NOTE** — In the event of a primary hand pendant failure, use the auxiliary hand pendant and foot pump to complete the procedure and contact your local Berchtold Corporation Service Representative.*

10. **BACKLIGHT –** Pendant backlighting (electroluminescent panel) combined with the green Power LED indicates that the pendant is active. The Backlight will time out after a preset time period, which can be set in the service software. The backlight timer can be set to a shorter time than the Controls Wakened state. This will reduce electrical current drain on the batteries, slightly extending the battery charge cycle. The lowest backlight timer setting is 1 second.

Figure 1-3 Primary Hand Pendant Indicators

PRIMARY HAND PENDANT FUNCTIONS

1. **POWER** - Turns the primary hand pendant on and off. The pendant will be backlit when activated (unless backlight timer is exceeded. See hand pendant operation section)

NOTE ▶ *NOTE: - The power switch on the base of the table must be in the ON position before the hand pendant will operate.*

NOTE ▶ ***NOTE*** *- If AC power is not present, the auto-shutdown feature will turn the control pendant off after a preset period of non-use. To reactivate the pendant, press any function button. If AC is present, the auto-shutdown feature is disabled, and the hand pendant remains on until it is turned off.*

2. **FLOOR LOCK** - Raises (unlocks) or lowers (locks) the floor feet.
3. **SPEED ADJUST (HI/LO)** – changes the rate of speed of all movements between normal and slow. This is useful when gradual motion is required.
4. **AUTO DRIVE REV/FWD** - (Optional) drives the table toward the head (forward) or foot (reverse). There is a slow acceleration, followed by a higher speed (~0.75m/s) if held.
5. **BACK** ⬍ - Raises and lowers the back section.
6. **TABLE** ⬍ - Raises and lowers the entire tabletop.
7. **LEG** ⬍ - Raises and lowers the leg section.
8. **TREND/REV TREND** (Trendelenburg) - Tilts the entire tabletop about the transverse axis.
9. **SLIDE FOOT/SLIDE HEAD** - Slides the table top toward and away from the head.
10. **TILT LEFT/TILT RIGHT** - Rotates the entire tabletop about the head to foot axis.
11. **UP KIDNEY/DOWN KIDNEY** - Raises and lowers the kidney elevator.
12. **FLEX** - Combines back down with reverse Trendelenburg to form an inverted V (jackknife position).
13. **REFLEX** - Combines back up with Trendelenburg to return from FLEX position.
14. **CHAIR** - Combines back up, Trendelenburg, and leg down functions to form a chair-like support. The three functions operate in a repeating sequence until the back section reaches 90° relative to the seat section and the leg sections reach 105° degrees relative to the seat section.

Figure 1-4 Primary Hand Pendant Functions

15. **UROLOGY** – Levels the table; then lowers the leg section to 90° or until a software limit is reached. (To bring the table to its lowest position and have LEG at 90°, slide must be fully toward the leg end)
16. **LEVEL** - Moves the table to a horizontal position that is within 1 degree of level. This function should be used prior to the Flex and Chair Functions.

FOOTSWITCH (Optional)

A footswitch control is available for procedures where the surgeon is normally seated at the pelvic end of the patient (Figure 1-5). Footswitch functions include:

- Trendelenburg/Reverse Trendelenburg
- Tilt Left/Tilt Right
- Table Up/Down

The footswitch is connected into the remote control connector box by aligning the red dot on the footswitch connector with the red dot on the socket in the remote control connector box. See Figure 1-5 for location of connector.

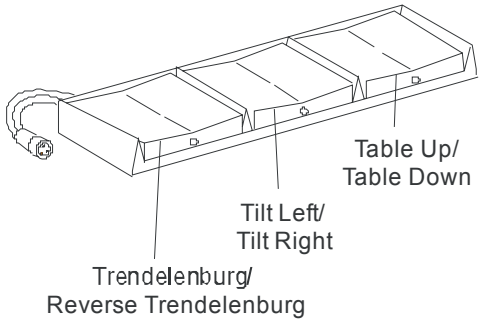


Figure 1-5 Footswitch

Pressing one of the footswitch controls turns the table on and places it in "controls active" status. However, none of the functions will operate unless the floor locks are set. The floor locks must be operated through the hand pedant.

MANUAL FOOT PUMP

The manual foot pump is used to provide hydraulic pressure when there is no electric power to operate the hydraulic pump. This could occur due to any of the following conditions:

- Battery power is low as indicated by a steady or flashing red battery light on the hand pendant.
- A combined failure of the battery and AC mains power supplies.
- A failure of the table's hydraulic pump or the electrical system that powers the hydraulic pump.
- A failure of table controls

The manual pump pedal is located at the patient left side near the head end of the base. DEPLOYING THE FOOT PUMP HANDLE TO ITS FULL OUTERMOST POSITION ENABLES THE AUXILIARY PENDANT AND DISABLES THE MAIN HAND PENDANT.

To use the manual foot pump:

1. Pull the foot pedal straight out as far as it will go. It will rotate counter clockwise as it is pulled outward.

Figure 1-6 Deploying Foot Pump Pedal

2. Extend the pedal until it clicks into position.
3. To articulate the table, press and hold the desired function button on the auxiliary control pendant (see next section) and operate the manual pump with your foot. For best results, depress the pump pedal completely, making full strokes, at the rate of about one stroke per second.

To re-insert the pump pedal:

1. Push the pedal back into the table until the end is inserted into the base cover.
2. Continue to push the pedal into the table until it snaps into the retracted position.

EMERGENCY UNLOCK

In the unlikely situation where the control system is completely disabled AND the auxiliary system is disabled, there is a back-up emergency switch that will allow the table to be unlocked and moved. It is wired directly to the batteries. There should always be enough power in the batteries to open the valve solenoids. This switch is located inside the base near the foot pump handle storage location.

Figure 1-7 Emergency Switch

Do this to access this switch:

1. Pull the foot pedal straight out as far as it will go. It will rotate counter clockwise as it is pulled outward.
2. Put one finger through the handle storage hole as shown and press the button.
3. The floor locks should release and the table should be resting on its casters.
4. Press the button again to switch off the power to the valve solenoid.

AUXILIARY HAND PENDANT

NOTE

NOTE *— Activating the auxiliary hand pendant* ***disables*** *the primary hand pendant.*

.The auxiliary hand pendant is identical to the main hand pendant. It has limited function when plugged into the auxiliary control connector, located in the auxiliary hand pendant compartment on the head end of the column. The active functions are Leg Up/Down, Table Up/Down, Back Up/Down, Floor Lock, Trend, Tilt Left/Right, and Kidney Up/Down. Only these buttons will be backlit when in auxiliary mode.

Figure 1-8 Auxiliary Hand Pendant

NOTE

NOTE *— The Auxiliary hand pendant is identical to the main hand pendant and may be used as a replacement for the main hand pendant. See Primary Hand Pendant for details.*

Use the auxiliary control pendant when:

- The primary hand pendant will not function.

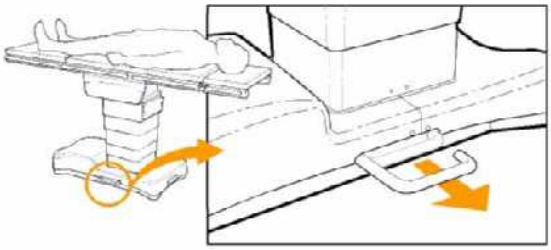
WARNING

WARNING *— The auxiliary hand pendant functions will operate regardless of whether the floor feet are locked or unlocked. If the floor feet are unlocked, the table may roll when the manual pump is operated.*

CAUTION

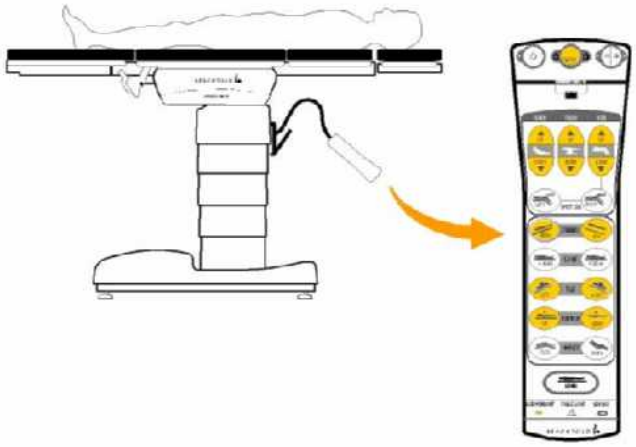
CAUTION *— The auxiliary hand pendant does not have the following functions: AUTO DRIVE, HI/LO, FLEX, REFLEX, UROLOGY, CHAIR, RETURN TO LEVEL, and SLIDE. This pendant is intended to be used for completing procedures, followed by charging the batteries or servicing the table.*

AUXILIARY PENDANT ACCESS INSTRUCTIONS



To activate Auxiliary Hand Pendant, Pull out the Manual Foot Pump which is located on the base (patient left)

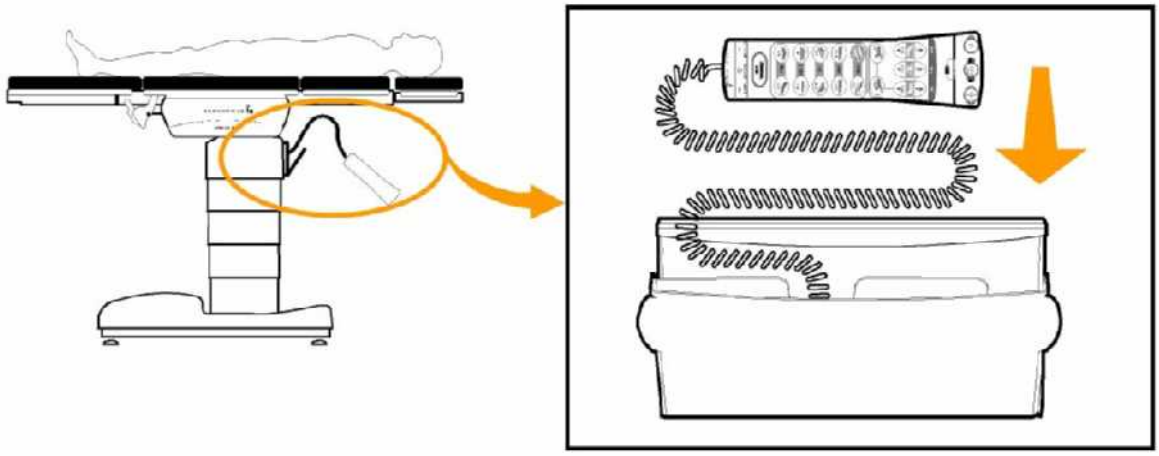
Deploying the Manual Foot Pump will disable primary pendant. This is indicated by flashing LED on primary pendant



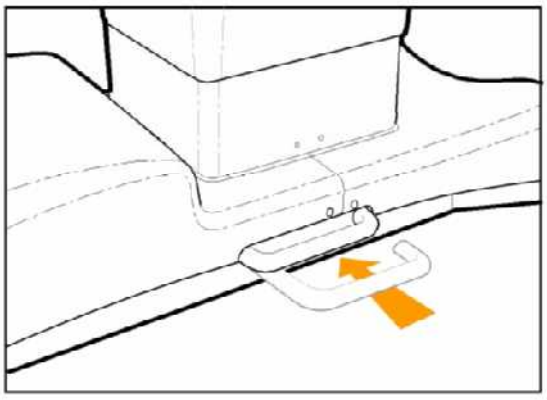
Open the Auxiliary Pendant Drawer and fully remove pendant and cord. The function keys that can be used will be backlit

Press and hold the desired function key while you operate the manual foot pump until the table top is in the desired position

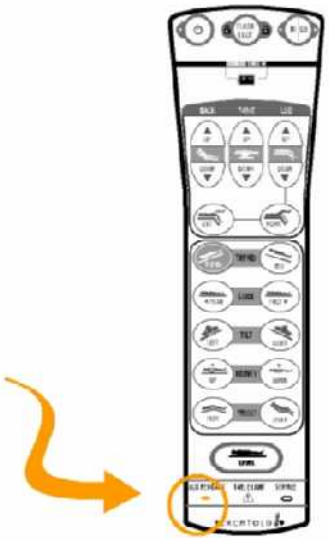
AUXILIARY PENDANT STORAGE INSTRUCTIONS



Carefully fit the hand pendant and cord back into the compartment.
The cord should be stowed first
When Stowed, lose the door firmly - The door should latch



Return the manual foot pump handle back to its starting position



Check to insure the primary pendant is functioning and the yellow LED light is off

TABLE 1-1 TECHNICAL DATA	
Electrical Power Requirements:	115 V AC +/-10% 50/60 Hz, 6A, Single-phase.
Environmental and Storage Requirements:	
Operation	Ambient temperature range of 50 to 100° F (10 to 38° C), relative humidity range of 10% to 95%, at altitudes from sea level to 8000 ft.
Transport and Storage	Ambient temperature range of –30 to +150° F (-34 to 66° C) relative humidity range of 0% to 95% at altitudes from sea level to 50,000 ft.
Table Top	Radiolucent and conductive carbon fiber panels conform to 21 CFR Subchapter J, Radiation Control for Health and Safety Act of 1968.
Dimensions:	
Length	82.6 inches (1930 mm)
Width	21 inches (533 mm); excluding the side rails.
Weight	Approximately 750 lbs. (340 kg)
Height Range	22.6” to 46.4” (573 mm to 1179 mm)
Head Section	12.2” (310 mm) X 21” (533 mm)
Back Section	22.6” (574 mm) X 21” (533 mm)
Seat Section (w/kidney elevator)	23.1” (587 mm) X 21” (533 mm)
Kidney Elevator	4.3” (109 mm) X 21” (533 mm)
Leg Section	24.6” (625 mm) X 21”(533 mm)
Range of Motion:	
Trendelenburg	Up to 30°
Reverse Trendelenburg	Up to 31°
Lateral Tilt	Up to 20° right or left
Back Section	From 45° below horizontal to 90° above horizontal
Kidney Elevator	Extendable up to 3.7” (76 mm)
Leg Section	From 30° above horizontal to 105° below horizontal
Headrest	Adjustable from 90° below horizontal to 90° above horizontal in 15° increments
Longitudinal Slide	16.8” (427mm) total
Flex	226°
Chair	Leg Section up to 105°, Back Section up to 90° relative to the Seat Section, which may be up to 30° in the Trendelenburg position.
Load Capacity:	
Lifting and Articulation	1000 lbs. (453 kg) all articulations (500 lbs. if patient is reversed)

If you need assistance, call Berchtold Technical Service at 800-243-5135.

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OPERATING INSTRUCTIONS

PINCH POINTS

WARNING	***WARNING*** *— Cutting or crushing injury may occur if any part of a patient or staff member is caught in a pinch point when the table is articulated.*
CAUTION	***CAUTION*** *— Damage to the table or object may occur if any foreign object is caught in a table pinch point when the table is articulated.*

Due to the variety of table positions attainable with the OPERON D 850 table, pinch or crushing points exist (Figure 2-1). The OR staff must be trained to ensure that body parts or surgical apparatus are not caught in pinch points when the table is operated.

This list is not all-inclusive, because pinch points can be created by the attachment of accessories. Always ensure that the patient and staff are clear of all pinch points before moving the table or while the table is in motion.

Pinch points include but are not limited to:

1. Kidney elevator to seat top
2. Kidney elevator to seat channels
3. Kidney elevator to back section
4. Headrest to back section
5. Back / Leg section link to seat channel
6. Side shields to column shields (in tilt)
7. Column shields to base cover
8. Base to floor
9. Floor feet to base
10. Floor feet to floor
11. Leg section to column shield
12. Foot pump handle to floor
13. Back Section to seat top.

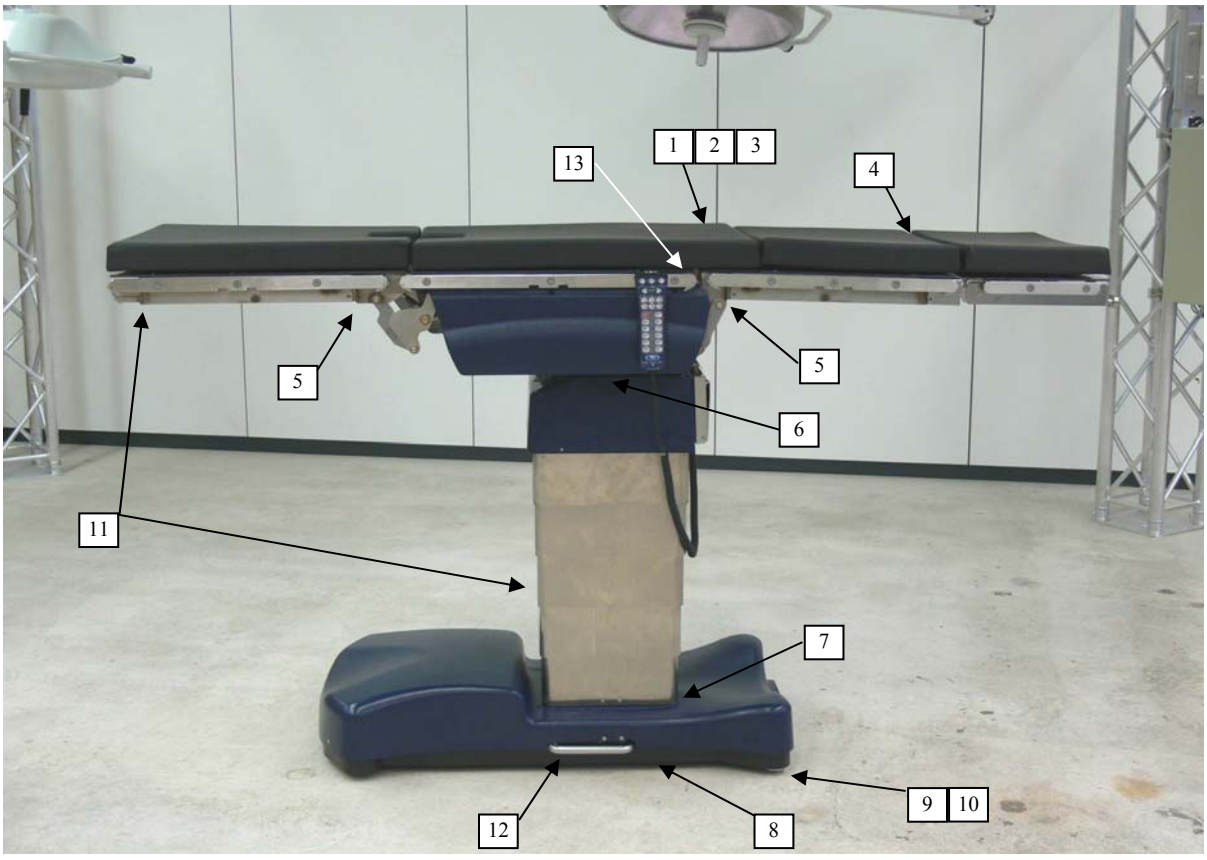

Figure 2-1 Pinch Points

ELECTROMAGNETIC INTERFERENCE

WARNING *— When using the table in the vicinity of high-frequency surgical equipment, such as cardiac defibrillators and cardiac defibrillator monitors, refer to the equipment manufacturers' instructions to ensure compatibility issues are considered.*

This surgical table has been tested to EN 60601-1-2 to ensure proper electromagnetic compatibility. Other products used in the vicinity of the surgical table should also comply with this standard. If they do not comply, interference between products resulting in unintended responses may occur. Please contact the appropriate manufacturer(s) if any problems arise.

If the integrity of the external protective earth conductor arrangement is in doubt, the surgical table should be operated from its internal electrical power source (batteries) until the situation is corrected. The batteries require charging at least once a week. If the integrity of the external protective earth conductor arrangement is in doubt, and the batteries are not charged, operate the surgical table with the manual foot pump and the auxiliary hand pendant until the situation is corrected.

LOAD CAPACITY

WARNING *— Overloading may result in tipping of the table or failure of the table sections to move. Do not exceed the maximum load.*

The patient lifting and articulation capacity is 1000 lbs (453 kg). This means that a 1000 lb patient can be moved into any of the standard procedural positions.

WARNING— Weight Limit in reverse, while not recommended, it is possible to place a patient in reverse orientation. Patient weight must not exceed 500 lbs. when placed in reverse.

PATIENT ORIENTATION

Orientation is defined as follows:

- The head end is the end where the power cord is connected.
- The Perineal cutout in the seat section is exposed
- Left and right, refer to the patients left and right.

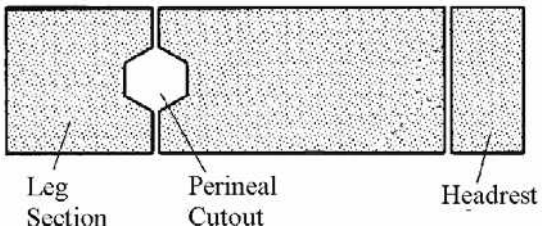

Figure 2-2 Table Orientation

PATIENT POSITIONING

WARNING *— POSSIBILITY OF TIPPING: If FULL SLIDE FORWARD IS REQUIRED, the patient's pelvis must always be located over the seat section. Utilizing full forward slide while the patient's pelvis is closer to the back section can impair table stability and result in patient injury or equipment damage.*

When the patient is placed in the Lithotomy position on the seat section, the following precautions must be followed to ensure safety and stability:

- The table must be securely locked to the floor and not mobilized while the patient is in this position.

WARNING *— The leg section may be removed from the table. If it is left on the table, use caution when raising the leg section while the patient is in the normal perineal position.*

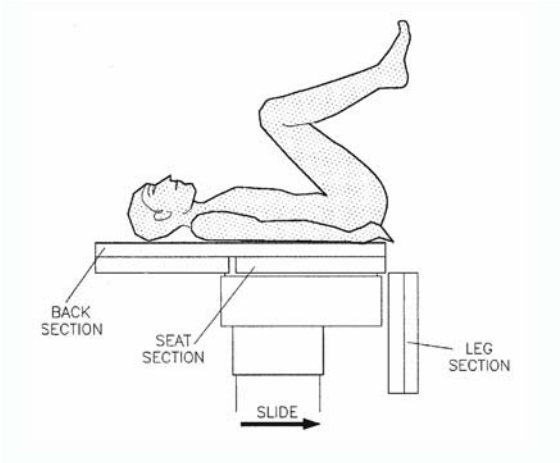

Figure 2-3 Normal Perineal Position

Certain ENT, Neuro, and Ortho procedures require that the table be moved after

anesthetizing the patient. If this is required, the following steps must be followed:

- Be sure that the patient is properly secured to the table with straps.
- Center (slide) the patient over the main lift column.
- Lower the table to its lowest point.
- Check the floor for and remove objects that may interfere with moving the table, such as power cords or table accessories.
- Have at least one person at each end of the table.
- Unlock the table.
- When moving the table, the people at each end must use a lateral force in the direction of motion; do not lift up on a section or push down on a section.
- Immediately lock the table when the new location is reached.

OPERATION

CAUTION *— Storage of clamps, accessories, etc., on the base cover may result in damage to lift column shields and prevent proper elevation or descent of the table.*

Note *— The table can be operated with or without the power cord connected to the mains inlet receptacle. Plug in the power cord if the batteries need recharging. The table may be operated while the batteries are charging.*

If desired, plug the table's power cord into a mains power source. When the table is plugged in via the power cord, it is powered by mains AC. When the power cord is not plugged in, the batteries provide power to the table. In either case, the ON/OFF switch on the base must be ON to articulate any table sections. When the ON/OFF switch on the base is OFF, the table's electronics and pump motor are isolated from the power supply and the batteries.

When the charge indicator lamp near the power cord receptacle is lit, the table senses mains AC and activates the battery charging system. Battery charging will occur whether the ON/OFF switch on the base is in the ON or OFF position. The table can remain plugged into AC indefinitely without damaging the batteries.

HAND PENDANT OPERATION

The table may be activated by pressing the hand pendant ON button or by pressing any of the hand pendant function buttons.

If you activate the table by pressing the ON button, the hand pendant LEDs for all Battery levels will flash briefly. This is a self-test function. During this time, no function is active. If there is a problem with the hand pendant, the connection to the table, or any of the table functions, the SERVICE LED will remain on.

If there are no problems, all LEDs except the Power, current floor lock status, and battery status displays will turn off, and the function buttons will become back lit to indicate that the table is in a "controls active" status.

To conserve battery power, the hand pendant will automatically go into SLEEP MODE after a preset period of non-use (default value). This time can be changed through the table's Service Software Program, which is described in the "Service Program" section of this manual. Additionally, hand pendant backlighting will turn off after a preset period of non-use (default value). This time can also be changed through the table's Service Software Program.

If you activate the hand pendant from the SLEEP MODE by pressing any of the function buttons (other than the ON button), the self-test will be performed after the button is released. If the floor locks are NOT locked, the back lighting will come on, and the hand pendant will go into "controls active" status, the feet will automatically descend and lock.

1. Press the ON button on the control pendant to activate the control pendant
2. Press FLOOR LOCK to lower the floor feet. The green LOCK indicator on the control pendant will light when the floor feet are locked.
3. Select the desired function by pressing and holding the appropriate function switch.
4. When the desired position has been reached, release the function button to stop movement.
5. After the patient has been transferred from the table, press FLOOR LOCK to raise the floor lock feet and allow table transport. The yellow UNLOCK

indicator on the control pendant will light when the floor feet are unlocked.

To operate any hand pendant function, press and hold the button for the action desired. If you press the floor lock or unlock function, you do not have to hold the button until the function is complete. Once started, the floor locking or unlocking action will be completed automatically.

Most articulations have software controlled limits. You can stop any motion by releasing the function button or you can hold the button until it reaches the limit set for that function, and the movement will stop automatically (the software limit indicator will flash).

If the table functions do not operate, check the following:

1. Is the ON/OFF switch on the base of the table in the OFF position?
   - Turn the switch to the ON position.
2. Is the yellow UNLOCK indicator lit?
3. Lock the floor feet.
4. Is the battery status LED red and flashing or steady?
   - Plug in the table to allow normal use and also recharge the batteries. - or -
   - Use the auxiliary pendant and foot pump to complete the operation.
5. Is the red SERVICE LED lit?

- A lit SERVICE LED indicates that service is required, but may not disable a table function or functions, depending on the failure. If a failure occurs that can allow an unsafe operation, the specific function, such as return to level, will be disabled but the other functions will remain enabled. Only a catastrophic failure of the main processor will light the SERVICE LED and disable all table functions. Always contact Berchtold Service if the SERVICE LED is lit.

Function Priority

When a function is selected using either the primary hand pendant or optional footswitch, the table will stop performing any function that was in progress. To resume the motion, you must release the function (or footswitch) button and press it again.

In most cases, you can press only one button at a time (exceptions are noted in the table below). If you press more than one button at the same time, neither will work. If you press a second button while one function is operating, the function will stop. To restart the function, you must release the function button and press it again.

TABLE 2-1 ALLOWED SIMULTANEOUS MOVEMENTS

(only 2 movements allowed)

Function	Trendelenburg	Height	Back	Leg
Back	Y	Y	-	Y
Leg	Y	Y	Y	-
Trendelenburg	-	Y	Y	Y
Height	Y	-	Y	Y

Table Movement Limits

Due to the OPERON D 850 table's extensive articulation range, some functions can not be combined at their maximum capability. These interfering functions are limited in two ways: by the table software and by the user.

Each table movement has a speed limit that is based on a percentage of the hydraulic pump power applied. These speed limits help to ensure smooth table movements and enhance patient safety.

Software-Controlled Limits

The software controls prevent the table parts from contacting the floor as well as other table components (internal and external), therefore preventing damage. For convenience, the function limits are described in Table 2-2. The user cannot override these limits using the control pendant.

TABLE 2-2 SOFTWARE CONTROLLED LIMITS	
Trendelenburg	**Trend will stop when any table section approaches the floor, base, column, or when internal components may collide.**
Reverse Trendelenburg	**Rev Trend will stop when any table section approaches the floor, base, column, or when internal components may collide.**
Tilt	**Tilt will stop when any table section approaches the floor, base, column, or when internal components may collide.**
Height	Minimum height – 22.6” Maximum Table height – 46.4” Minimum height with Leg down 90° and slide at full foot end – 27.5” **Height Down will stop when any table section approaches the floor, base, column, etc.**
Kidney	Max Kidney height – 3.5” **Kidney up will stop when the back section is greater than or equal to 20°**
Back	Max Back up – 90° Min Back Down – 45° **Back Up will stop at 20° up when Kidney bridge is deployed (regardless of kidney height)**
Leg	Max Leg up – 30° Min Leg down – 105° **Leg down will stop when the leg section approaches the floor, base, column, etc.**
Slide	Full slide 17” Trend or Rev Trend angle greater than 10° Slide disabled **Slide will stop when any table section approaches the floor, base, column, etc.**
Chair, Flex, Reflex, Urology, Level	The automatic functions will stop any function that may come in contact with the floor, base, column, etc. The Level function may attempt to move another function to remove the crash situation and complete the leveling of the table top.

User-Controlled Limits

CAUTION *— Watch the table at all times while performing multiple articulations. Stop table movements before collisions occur. Failure to do so could result in damage to the table.*

When accessories are used, some collisions are possible particularly at low table heights. When combining functions, you must monitor the table’s position to ensure collisions are avoided.

HEADREST

WARNING *— Do not mount knee crutches or leg holders to the headrest side rail. The headrest should only be used for supporting the head or feet. Do not lean on the headrest. The headrest has a weight limit of 50 lbs.*

WARNING *— When articulating the headrest, be sure that the locking mechanism engages completely, and does not hang in between positions. Until the locking mechanism engages, the headrest may move*

when a load is applied.

***WARNING** — When releasing the locking mechanism, support the headrest, as it will fall freely if the locking mechanism is not engaged.*

The table headrest can be latched in any position from 45° above horizontal to 90° below horizontal.

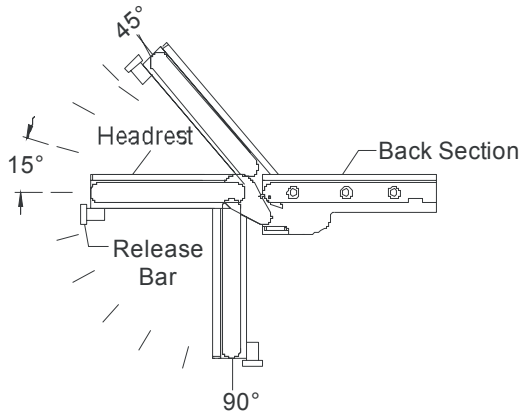

Figure 2-4 Headrest

To raise and lower the headrest:

a. Release the locking mechanism by pressing the release latch on the underside of the headrest.

b. When the headrest is properly positioned, release the latch.

REMOVABLE BACK AND LEG SECTIONS

***WARNING** — Failure to securely lock the leg section into place may result in patient injury. Always check the retention of the leg section upon installation.*

Install the section as follows:

1. Using the pendant, activate BACK or LEG function until the section pivots are horizontal.

2. Once the pivots are horizontal, slide the section onto the pivots. The leg section has guides formed into the underside of the support plate to aid in alignment.

3. Slide the section towards the seat section until it comes to a stop and the locks on both sides snap into place. Look for the green dot to appear in the window on the side of the section frame.

4. Attempt to pull the section away from the table to make sure that it is retained. If not, push evenly until the locks engage.

Figure 2-5 Leg Section Attachment

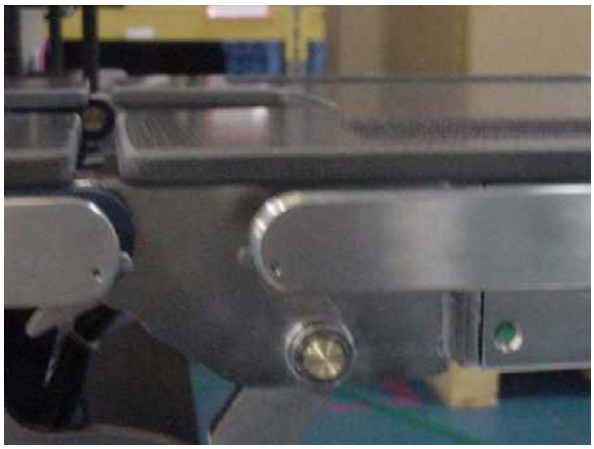

Figure 2-6 Assembled Leg Section

To remove the sections:

Depress the two latches located in the underside of the section frame to release the locking mechanism. Pull back evenly.

The table top hydraulics consist of the table top distribution blocks, back, leg, and kidney cylinders.

The pressure and tank lines for the top column manifold are shrouded by the column covers. They feed through side openings within the table top.

The back cylinders are in parallel. The leg cylinders are in series and have an additional compensation valve which allows the left and right cylinders to remain synchronized. To synchronize the leg cylinders. Turn the table OFF at the power switch. Press the LEG UP and LEVEL buttons on the hand pendant and turn the table ON at the power switch

The kidney cylinders are in series. The left and right kidney cylinders are also different. The left kidney cylinder has OD larger than the right kidney cylinder. The strokes are identical. The kidney sensor is an optical switch mounted on the left side of the table.

BERCHTOLD recommends that the table top cylinders not be replaced by the end user because of the risk of contamination entering the hydraulic system.

FOOTSWITCH (OPTIONAL)

CAUTION

CAUTION *— The Footswitch's electrical connections are resistant to fluid intrusion, but if fluid drainage is anticipated, the footswitch should be protected by wrapping it with a clear disposable footswitch bag. This will reduce the need to disinfect the footswitch.*

NOTE

NOTE *— to operate the footswitch control, the floor feet must be locked.*

NOTE

NOTE *— It is not necessary to press the primary hand pendant ON/OFF switch when operating the footswitch control. The primary hand pendant can not be operated simultaneously with the footswitch.*

The footswitch plugs into the left lower connector on the receptacle box, which is located on the head side of the column, under the table top. Align the red dot on the footswitch connector with the red dot on the mating connector (facing down). (See Figure 2-7.)

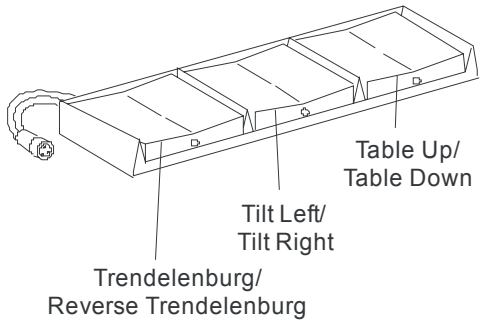

Figure 2-7 Footswitch

NOTE

NOTE *— To avoid inadvertent actuation, the footswitch should be disconnected for procedures that do not require its use.*

The footswitch will not operate if the red battery indicator is lit, either flashing or steady.

To operate the table, select the desired function by pressing the appropriate side of the rocker switch. Pressing the opposite side of the rocker will reverse the direction of travel. Releasing the rocker switch will stop table movement.

PRINCIPLES OF OPERATION

HYDRAULIC SYSTEM

WARNING	***WARNING*** *– POSSIBILITY OF INJURY: The HYDRAULIC system must be kept free of contamination. Contamination can cause the hydraulic system to fail, resulting in personnel injury or equipment damage.*
CAUTION	***CAUTION*** *– The hydraulic system on the OPERON D 850 surgical table contains micro-hydraulic valves, which are very sensitive to contamination. Only a qualified, trained service technician should open the hydraulic system, and only after all other repair procedures have been tried. Always use clean tools, and cover or wrap any loose hydraulic lines with clean plastic bags.*
CAUTION	***CAUTION*** *— Use only BP Energol HLP-HM 32 (or approved substitute ARAL VITAM DE32) hydraulic fluid. The use of other fluids could damage the hydraulic system.*
NOTE	***NOTE*** *– See (Ref) for the hydraulic system schematics.*

Hydraulic Power Unit

A hydraulic pump, driven by an electric motor, is the primary source of hydraulic power. The hydraulic pump has a relief valve set at 2175 PSI (150 bar). The operating pressure is dependent on the load on the pump and the flow required. It can vary from 0 to 2175 PSI. Power unit is mounted in the base.

Hydraulic Manifolds

The table has 2 hydraulics manifolds and two hydraulic distribution blocks. The manifolds direct hydraulics fluid to valves and cylinders that move various parts of the table. The manifolds are made up of hydraulic valves that are actuated by 24VDC solenoids. The solenoid valves are field replaceable, but certain individual hydraulic components that make up the manifold are not field replaceable.

Each manifold has a 25 micron filter on the input. There is an additional 60 micron filter between the A and B sides of each valve (see Table 4-2).

Column Manifold

A manifold on the main lift column provides hydraulic fluid to the following cylinders

- Main lift cylinders (3)
- Trendelenburg cylinder
- Tilt cylinder
- Back cylinders (2 in parallel)
- Leg cylinders (2 in series)
- Kidney cylinders (2 in series)

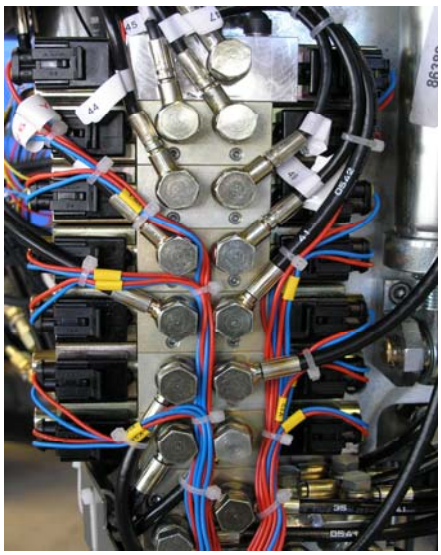

Figure 3-1 Manifold Distribution Blocks

Two hydraulic distribution blocks, mounted within the upper support frame, direct hydraulic fluid from the column manifold to the Back, Leg, and Kidney cylinders.

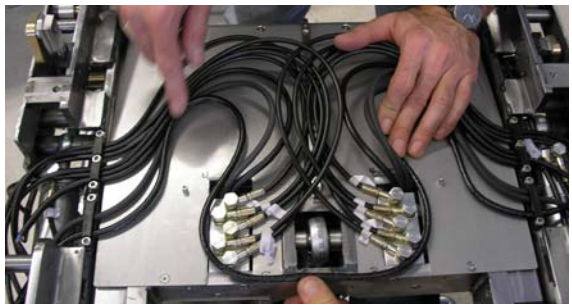

Figure 3-2 Distribution Blocks

Floor Lock Manifold

One Manifold controls the floor lock system. Located in the left foot section of the base, the floor lock manifold directs fluid to the individual cylinders lift the table off from its casters, thus locking the table from horizontal movement. The manifold contains no field replaceable parts. It must be replaced as a complete unit.

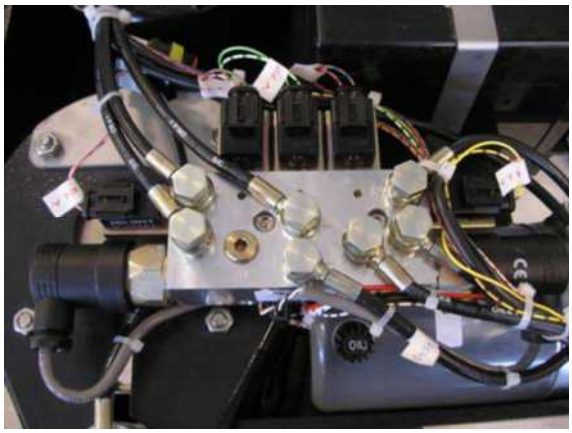

Figure 3-3 Floor Lock Manifold

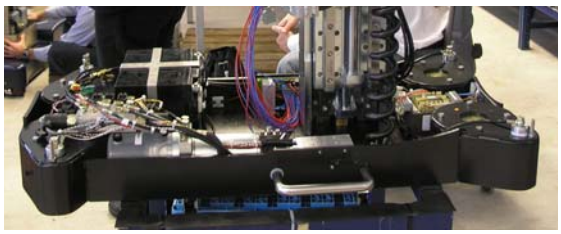

Figure 3-4 Location of Floor Lock Manifold In Base

FLOOR LOCK SYSTEM

The floor lock system uses 4 hydraulic cylinders in parallel as shown.

The floor lock system can compensate for uneven floors up to 0.25" (6mm). This is accomplished by using 2 pressure switches to control the fluid flow to the cylinders.

The sequence of events when locking and unlocking the feet is as follows (the table base ON/OFF switch must be ON):

1. Power is applied to pressure switch P2 to tell the controller the status of the feet.
2. The Lock button on the hand pendant is pressed, initiating the pump and pressurizing the manifold.
3. Power is applied to solenoid Y71 and pressure switch P1
4. Fluid flows to cylinders 1 and 2 via the one way check valve in solenoid Y73.
5. Cylinders 1 and 2 move to full stroke. When they reach full stroke, the pressure continues to build until it reaches 1740 PSI (120 bar).
6. At 1740 PSI (120 bar), pressure switch P1 closes.
7. Solenoids Y74 and Y75 energize and allow fluid to flow to feet 3 and 4 via the extension board. LEDs on the extension board will turn on and off to indicate movement of the locks.
8. When valves Y74 and Y75 are open, the pressure is the same at feet 3 and 4. If the floor is uneven, the fluid will flow to the foot with the least resistance, which on an uneven floor, is the one that must travel the most distance.
9. When both feet hit the floor, the pressure increases.
10. Pressure switch P2 closes when the pressure reaches 580 PSI (40 bar).
11. When P2 closes, a signal is sent to the controller that the feet are locked, illuminating the lock LED on the pendant, and de-energizing the pump and the power to P1, Y74, and Y75.
12. When Unlock is pressed, Y72 is energized, allowing pump pressure to open the pilot valves. Y73 is energized to allow fluid to flow from feet 1 and 2, and fluid flows freely from Y74 and Y75 via their check valves. Springs in each foot push the fluid out, allowing the feet to retract.

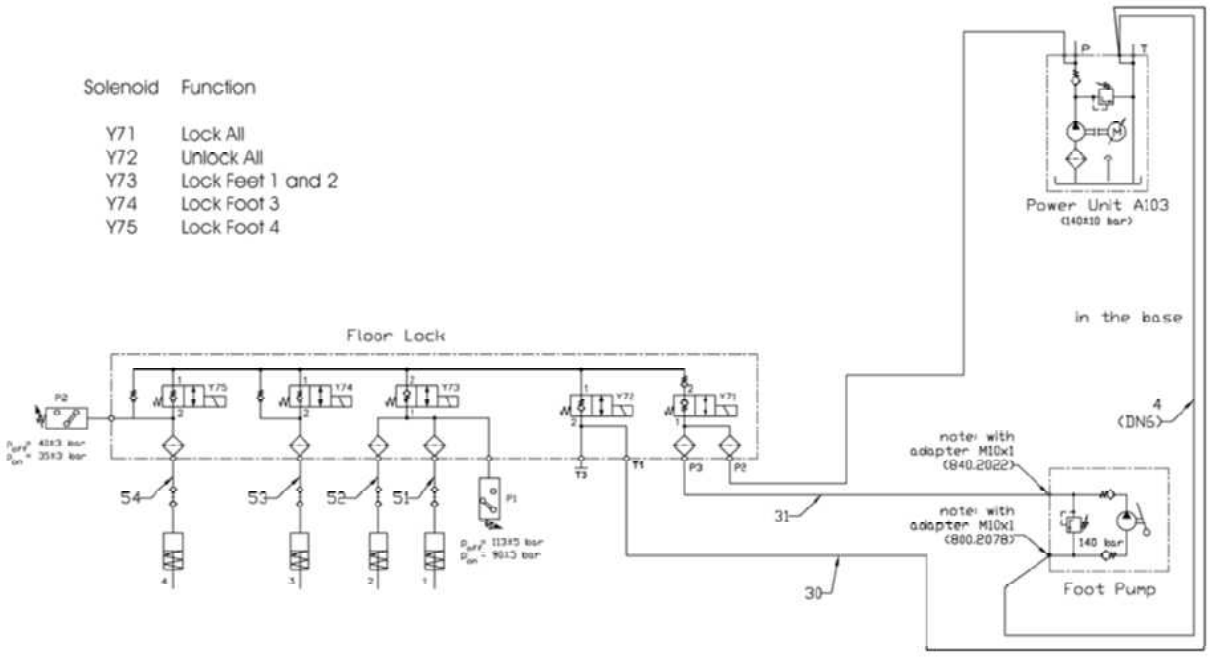

Figure 3-5 Floor Lock System Operation

MANIFOLD VALVE DESCRIPTION

The drawing below illustrates the valve slice used for all hydraulic manifolds except the foot lock. Table 4-1 describes the operating range for the valves.

The manifold valves are 3 way directional control valves with pilot operated check valves and integrated return throttles (A and B). The pilot operated check valves enable the actuator to be stopped and held in position, even under external loading.

Valves are field replaceable, but they do not contain any field replaceable parts. Field replacement of the valve may allow contamination to enter the system and is therefore discouraged.

The pressure switches are field replaceable. However, field replacement of the switch may allow contamination to enter the system and is therefore discouraged. The plugs on the pressure switches should never be rotated. Always pull them straight off to avoid damaging the switch and the harness.

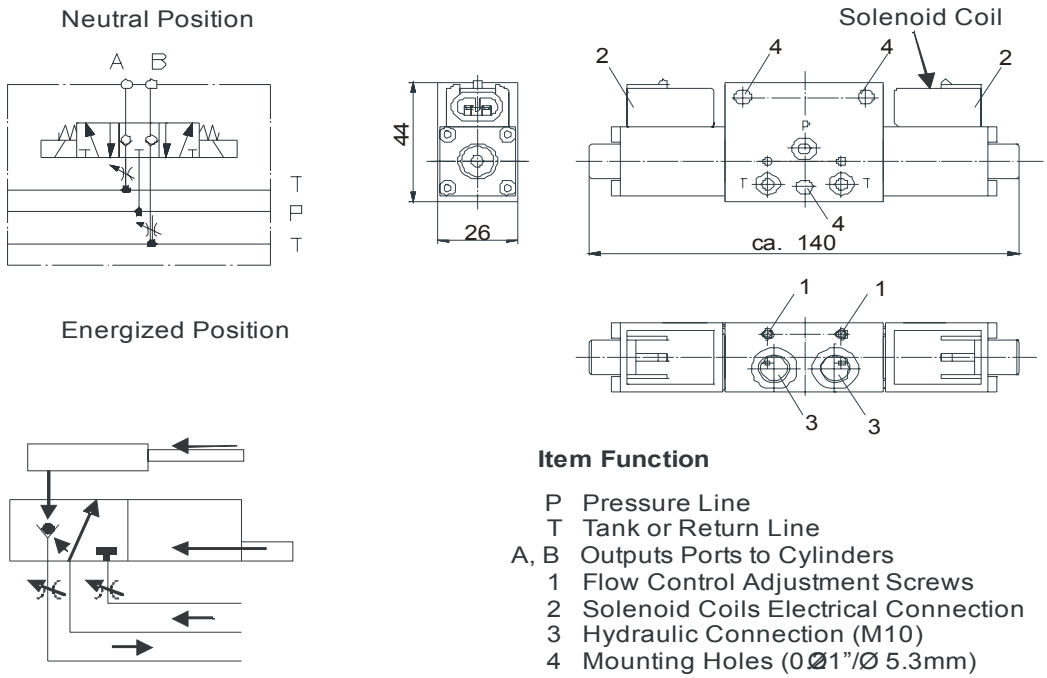

Figure 3-6 Manifold Valve

TABLE 3-1 MANIFOLD VALVE OPERATING SPECIFICATIONS

Parameter	Range
Operating Pressure	Up to 3626 PSI (250 bar) depending on flow rate
Flow Rate	61 $in.^3$/min (3 dm^3/min) maximum
Ambient Temperature	-22 °F to +212 °F (-30 °C to +100 °C)
Pressure Medium Temperature	-7 °F to +176 °F (-20 °C to +80 °C)
Pressure Medium	Hydraulic oil per DIN51524 and DIN51525
Viscosity Range	0.0006 $in.^3$/s to 0.0195 $in.^3$/s (10 mm^3/s to 320 mm^3/s)
Filtration	25 µm to 40 µm
Installed Position	Any
Seal Material	NB Rubber
Nominal Voltage	24 VDC (18 to 32 VDC)
Power Consumption	10 Watt (per solenoid)
Electrical Connection	AMP Superseal Series 1.5 plug (double-pole)
Duty Cycle	100% ED

Manifold Valve Operation

The manifold valves operate as follows:

1. Hydraulic pressure is applied to the P (pressure) fitting of a valve.
2. A solenoid coil (item 2) is energized by an 18V -32V DC signal.
3. The coil forces the 3-position solenoid spool to move. This is illustrated in the section of the graphic labeled “energized position”.
4. Fluid flows from the center pressure line out to the cylinder.
5. A pilot pressure pushing on the check valve opens the return path.

6. The variable flow control valve on the return line can control the flow or cylinder speed.
   - A flow control screw on each valve can be adjusted with a 2.5mm Alan wrench.
   - Turning the screw clockwise reduces the flow. (See the drawing above for the location of the flow control screws.)
7. When power is removed from the solenoid, the valve locks in the neutral position. This prevents any cylinder movement.

COLUMN HYDRAULICS

General Information

The drawing below shows a schematic of the column cylinders.

All cylinders in the column are dual actuated, which means that hydraulic pressure is required to push the cylinder in both directions. The foot locks, which are on the base, are single action poppet valves: pressure is required only to move the legs to the locked position.

There are 3 lift cylinders: One in the lower stage and the other in the upper stage.

The lift cylinders are not field replaceable. Although highly unlikely, a failure of one of these cylinders will require that the table be returned to the manufacturing facility for repair. A loaner table may be shipped for the customer to use while repairs are being made.

There is one Trendelenburg cylinder.

There is one Tilt Cylinder.

There are two hydraulic fluid distribution blocks to connect many of the valves and cylinders.

The solenoid valves on the "A" side in the schematic are on the left side of the hydraulic manifold, and the solenoid valves on "B" side in the schematic are on the right side of the manifold.

All solenoid valve labels start with "Y"

The column Solenoids and their functions are listed below.

TABLE 3-2 COLUMN SOLENOIDS

Function	Solenoid Valve	Side
Tilt Up	Y11	A
Tilt Down	Y12	B
Trendelenburg	Y21	A
Reverse Trendelenburg	Y22	B
Height Up	Y31	A
Height Down	Y32	B
Kidney Up	Y41	A
Kidney Down	Y42	B
Back Up	Y51	A
Back Down	Y52	B
Leg Up	Y61	A
Leg Down	Y62	B
Leg Compensation	Y63	A
Leg Compensation	Y64	B

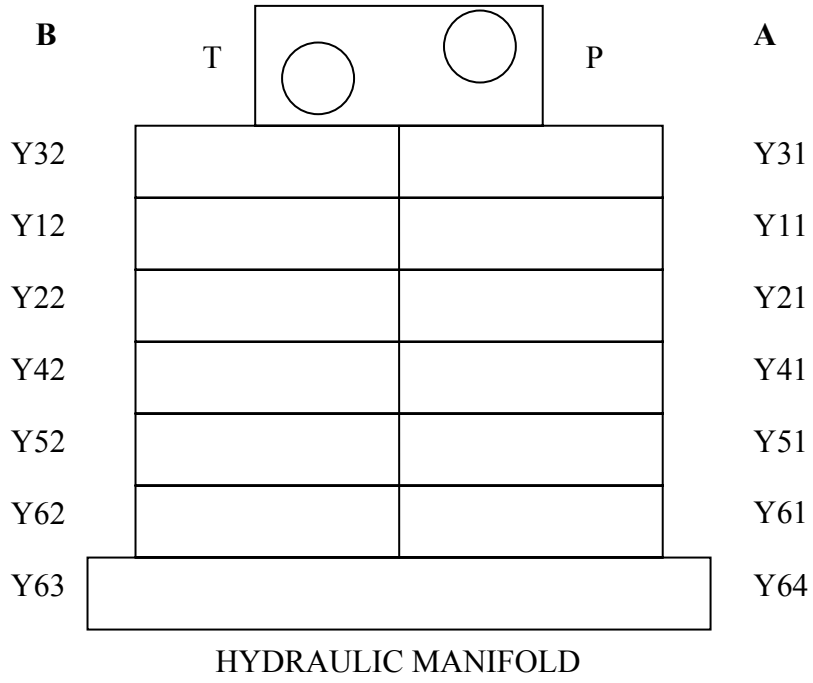

Figure 3-7 Column Hydraulics

DETAILS OF OPERATION

HEIGHT UP AND DOWN

Figure 4-1 Lift Column/Cylinders

Hydraulically, the three lift stages are driven in parallel but will move in series due to the increase in pressure associated with lifting each successive stage.

TILT LEFT AND RIGHT

BERCHTOLD recommends that the tilt cylinders not be replaced by the end user because of the risk of contamination entering the hydraulic system.

Tilt right and tilt left movements are independent of any other function.

Tilt right is achieved by solenoid Y12 retracting the tilt cylinder. This pulls the right side of the table down.

Tilt left is achieved by solenoid Y11 extending the tilt cylinder. This pushes the right side of the table up.

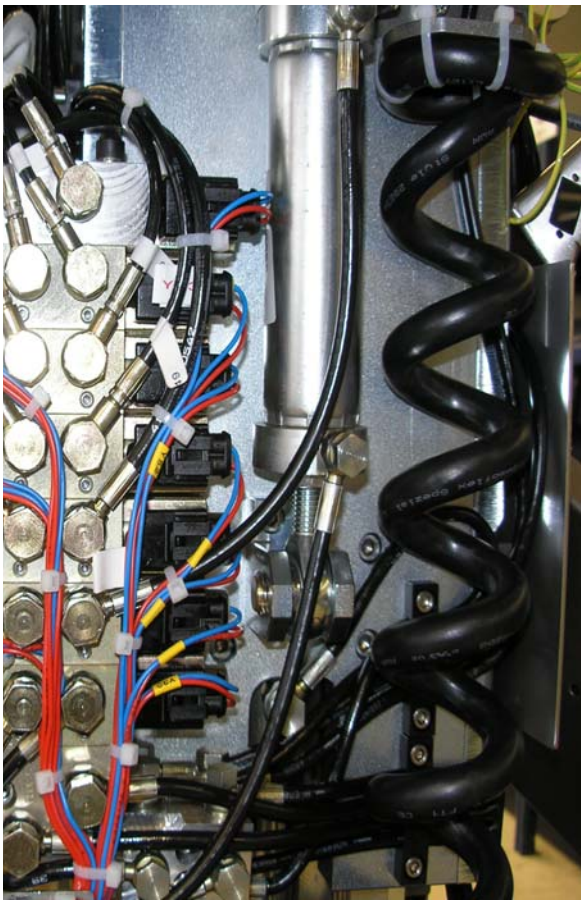

Figure 4-2 Tilt Cylinder

TRENDELENBURG AND REVERSE TRENDELENBURG

Trendelenburg and reverse Trendelenburg are independent of any other column function with the exception of limitations listed in Table 2-2.

There is a single Trendelenburg cylinder on the foot side of the column.

Trendelenburg is activated via solenoid Y21.

Reverse Trendelenburg is activated via solenoid Y22.

BERCHTOLD recommends that the Trendelenburg cylinder not be replaced by the end user because of the risk of contamination entering the hydraulic system.

TABLE TOP HYDRAULICS

The table top hydraulics consist of the table top distribution blocks, back, leg, and kidney cylinders.

The pressure and tank lines for the top column manifold are shrouded by the column covers.

They feed through side openings within the table top.

The back cylinders are in parallel. The leg cylinders are in series and have an additional compensation valve which allows the left and right cylinders to remain synchronized. To synchronize the leg cylinders. Turn the table OFF at the power switch. Press the LEG UP and LEVEL buttons on the hand pendant and turn the table ON at the power switch

The kidney cylinders are in series. The left and right kidney cylinders are also different. The left kidney cylinder is larger than the right kidney cylinder. The strokes are identical. The kidney sensor is an optical switch mounted on the left side of the table.

BERCHTOLD recommends that the table top cylinders not be replaced by the end user because of the risk of contamination entering the hydraulic system.

Figure 4-3 Hose Routing To Upper Frame

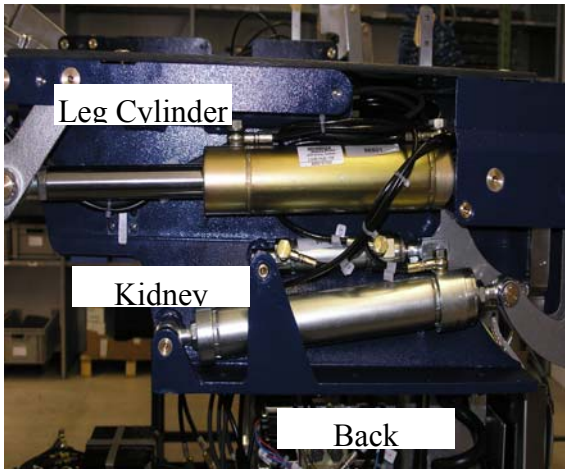

Figure 4-4 Right Side Frame Cylinders

The following drawing shows cylinders exploded. The back and leg cylinders have different strokes (and part numbers), but their construction is the same. Similarly, the two kidney cylinders have different strokes (and part numbers), but their construction is the same.

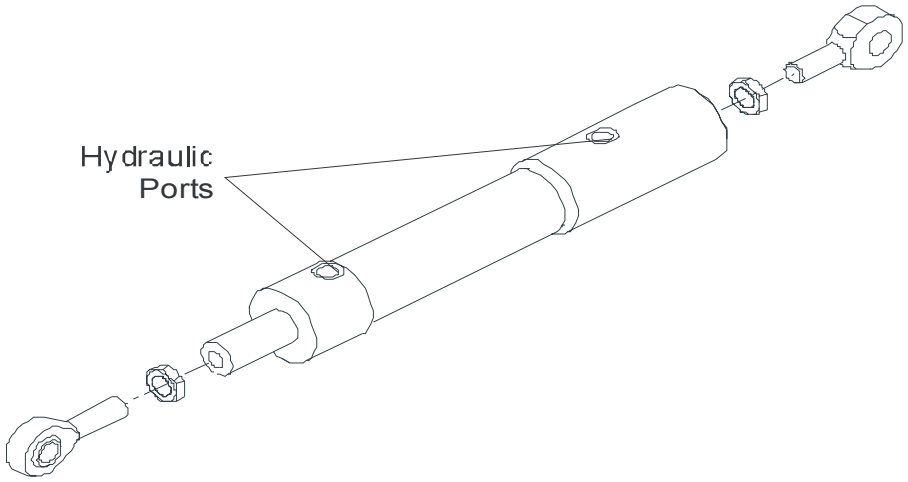

Figure 4-5 Back and Leg Cylinders

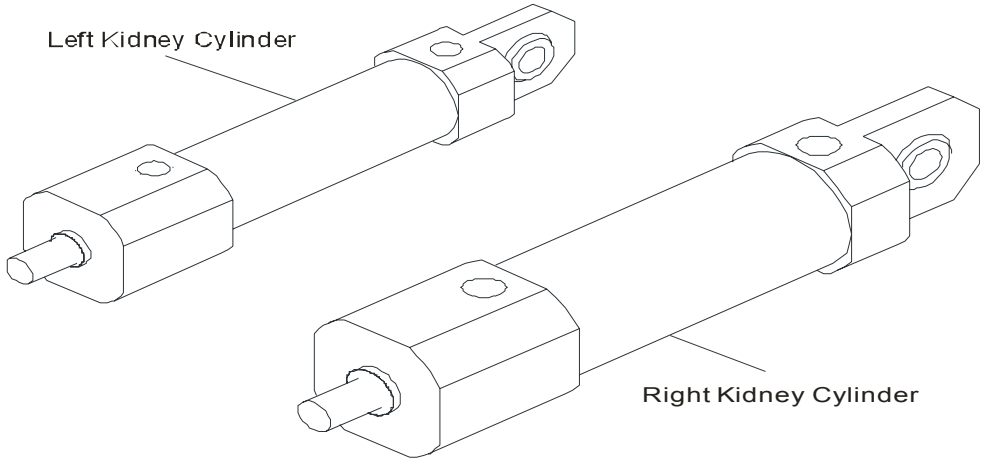

Figure 4-6 Left and Right Kidney Cylinder

HOLLOW PLUGS AND SEALS

Hydraulic lines are secured to cylinders and manifolds using hollow plugs and washers with rubber seals.

The seal washers should be used only once. If the hydraulic system needs to be opened, the seal washers should be replaced.

Hollow plugs and seal washers come in 2 diameters: 10mm and 8mm. The kidney and slide cylinder fittings use 8mm plugs and seals. All other hydraulic fittings use 10mm hollow plugs and seals.

Hollow plugs also come in 2 lengths: single length and double length. The double length 10mm plug is used where two lines must connect at the same port, such as at the foot lock manifold. The double length 8mm hollow plug is used only when filling the kidney cylinders because they are connected in series.

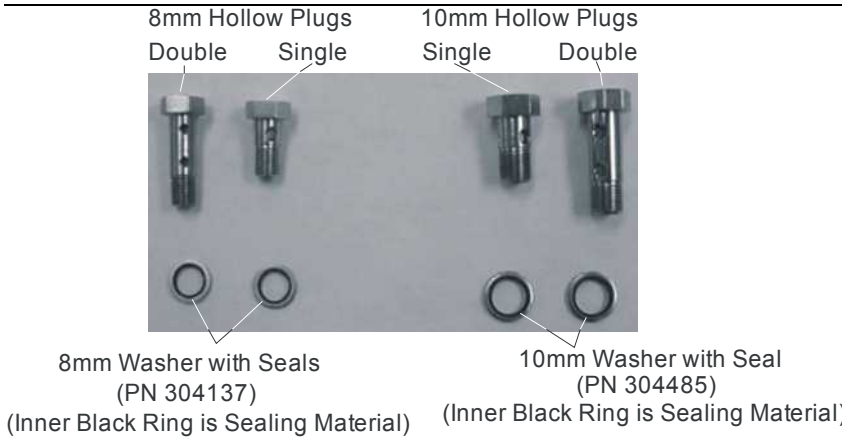

Figure 4-7 Hollow Plugs and Washers

Using Hollow Plugs and Washers to Secure Hydraulic Lines

The 10mm Hollow plugs have a 14mm hex head. The 8mm Hollow Plugs have a 12mm hex head. A Washer must be placed between any 2 surfaces. A single length hollow plug requires 2 washers, and double length requires 3 washers.

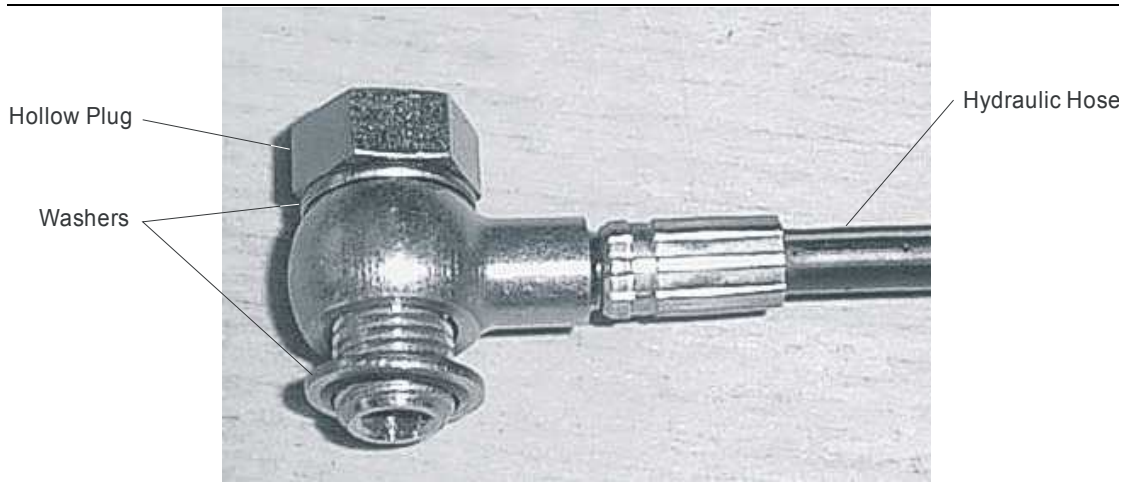

Figure 4-8 Securing Hydraulic Line

Hollow Plug Torque Specifications

CAUTION	***CAUTION*** *– Do not over tighten the hollow plugs. Over tightening can cause the seals to deform and leak.*

Hollow plugs must be torqued to the settings specified (± 10%) in Table 4-1. Be careful not to over torque the fittings.

Plug Size	Torque Setting	
	Ft Lb	N•M
M8	7.3	10
M10	10.3	14
G1/8 (1/8"	10.3	14

TABLE 4-1 HOLLOW PLUG TORQUE SPECIFICATIONS

SERVICE

HYDRAULIC FLUID

The **OPERON D 850** Surgical Table hydraulic system uses BP Energol HLP-HM 32 (or ARAL VITAM DE 32) hydraulic fluid (see Drawing 306762 in Section 8). This hydraulic fluid is available world wide, but can also be purchased from BERCHTOLD.

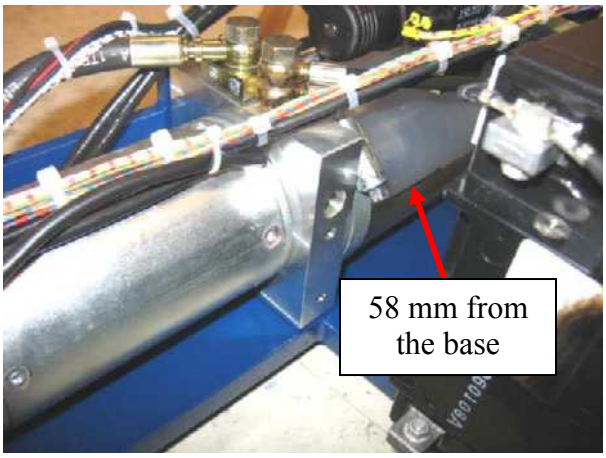

Figure 5-1 D 850 Reservoir

This is the reservoir fluid height with the table raised to its maximum height and with the table sections level

ELECTRONIC CONTROL SYSTEM

WARNING	***WARNING*** *– When servicing the table, turn power off or remove the appropriate fuses to prevent personal injury. If power is required, use care to avoid contact with live parts.*
NOTE	*NOTE – The table can be factory configured for 230 VAC operation based on customer order requirements. The modifications involve only components associated with the AC mains supply. The information below describes only the 115 VAC components. Refer to the schematic diagrams in Section 5 and the parts listing in Section 8 for identification of the 230 VAC components.*

The electrical system is made up of 7 parts:

1. CPU & Control wiring
2. Position Sensors and Switches
3. Power Supply System
4. Power Input System
5. Controls (Main and Auxiliary Pendants)
6. Slide Motor
7. Drive Motor (optional)

CPU

The Central Processing Unit (CPU) is the brains of the table. It contains the software and controls the operation of the solenoids and power unit based on inputs from the operator (via the pendant) and signals from the table (via the positioning sensors and switches).

A second controller serves as a back up for the primary CPU allowing basic function control of the valves. In the event of a failure of the primary CPU, the auxiliary pendant can be used with the foot pump.

The CPU is located on the column beneath the column covers. The CPU contains no field serviceable parts. It must be replaced as a complete assembly.

See drawing 86799 for wiring connections and electrical component locations

CAUTION	***CAUTION*** *– Do not mix hydraulic fluid types. Other hydraulic fluids can be incompatible with the seals in the OPERON D 850 table and can cause equipment failure or reduce the service life.*

Communication Interface (RS232) Board

The connector board is located on the top of the bellows on the left side of the table. This board connects the CPU to the RS-232 PC interface

Position Sensors and Switches

The position sensors provide the CPU with information about the position of the table for use in return-to-level, chair, and flex settings, and in software control limits. Drawing 86799 in the appendix shows the location of all sensors.

There are 11 sensors and switches in the table:

1. Slide Sensor
2. Leg Position Sensors (2 ea)
3. Leg Hall Effect Sensor
4. Back Position Sensor
5. Back Hall Effect Sensor
6. Tilt / Trendelenburg Sensor
7. Kidney switch
8. Auxiliary Pendant Drawer Switch
9. Height Sensor
10. Auto Drive Motor Position Switch

Slide & Height Sensor

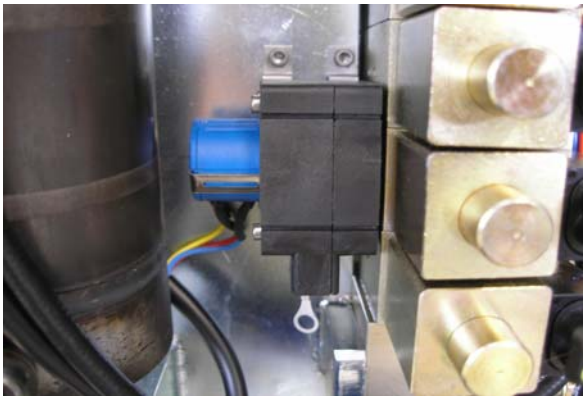

Figure 5-2 Height Sensor

The slide and height sensors are DC potentiometer s (10k Ω voltage divider) with an output signal from 0 to 5 VDC. The height sensor has a longer sensor cable than slide.

Figure 5-3 Slide Sensor

Software senses readings from 0.5 (at extreme forward slide) to 4.5 VDC (at extreme reverse slide). A reading of 1.5 VDC is nominal when the table top is centered over the column.

Auxiliary Pendant Switch

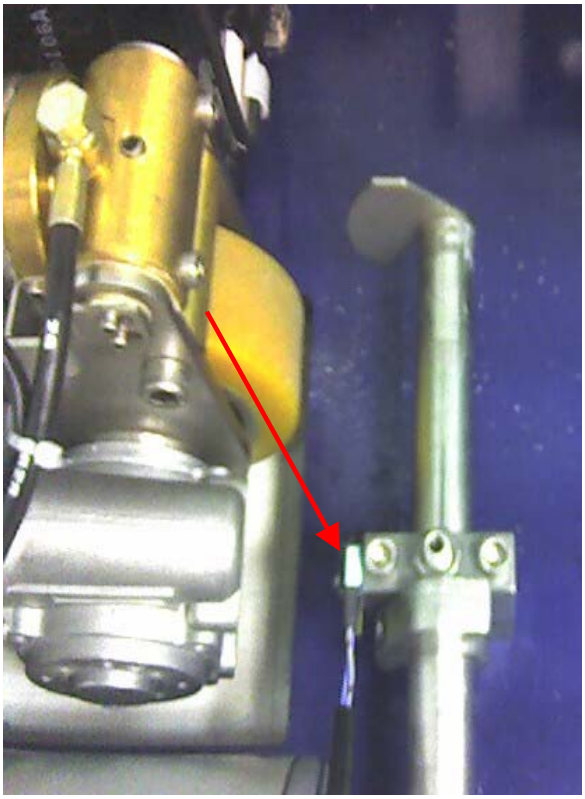

Figure 5-4 Auxiliary Pendant Switch

The auxiliary pendant switch is a limit switch. When it senses that the foot pump handle is pulled out, it signals the CPU to provide power to the auxiliary pendant and turn off the primary hand pendant. The auxiliary pendant switch is located inside the base.

Kidney Switch

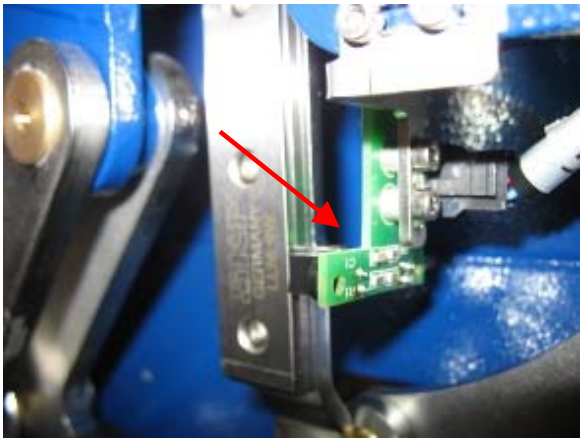

Figure 5-5 Kidney Switch

The kidney switch is mounted on a bracket on the left side of the table (opposite the leg and back sensors).

The kidney switch provides a signal to the CPU to determine the position of the kidney elevator. A signal of 2.5 volts indicates that the kidney elevator is up. A signal of 4.5 volts indicates that it is down.

Trend/Tilt Sensor

Figure 5-6 Trend/Tilt Sensor (viewed from under table)

The Tilt /Trendelenburg sensor is two standard automotive accelerometers which have been combined into one housing. It is excited with 5 volts, and has an output of between 0.200 –4.9 volts. The nominal voltage at level is 2.5 volts.

Leg and Back Angle Sensors

The Leg and Back Angle sensors are standard automotive accelerometers. They are excited with 5 volts, and has an output of between 0.200 –4.9 volts. The nominal voltage at level is 2.5 volts.

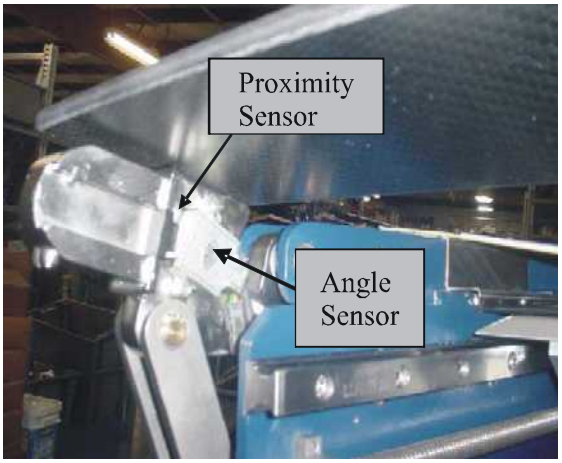

Figure 5-7 Leg & Back Section Proximity Sensors

The leg and back sections are equipped with Hall Effect sensor elements, which allow the software to detect whether the individual section is present.

Power Supply System

The power supply system is made up of 3 main components:

The isolation transformer
The power supply/charger assembly
The batteries

The isolation transformer takes 120VAC and provides 120VAC to the power supply. Its purpose is to reduce leakage current.

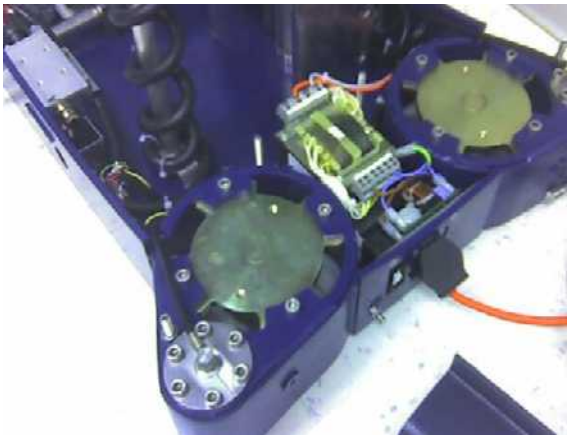

Figure 5-8 Power Supply System

The power supply/charger assembly will provide power to the table if the batteries are damaged or disconnected. It will charge the batteries to 90% within 8 hours.

Input Voltage Range	100/127V or 220/240V, 50/60Hz
Output Voltage	24V-30V, non regulated
Output Power	240W
Max. Charging Current	2.5 A
Max. Charging Voltage	29.1V
Enclosure Leakage Current	NC: <10µA, SFC: <50µA
EMI/EMC protection	EN 60601-1-2:2001

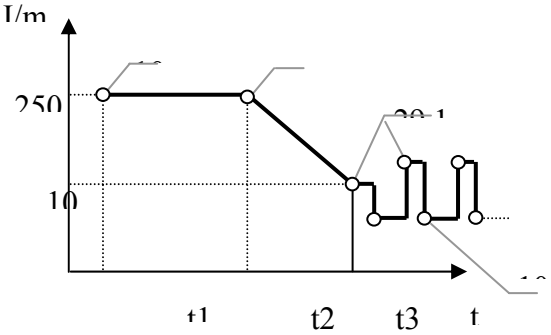

Figure 5-9 Charging circuit output diagram

The power supply does not contain any field serviceable parts. It must be replaced as a unit. The transformer and batteries also must be replaced as units.

Batteries

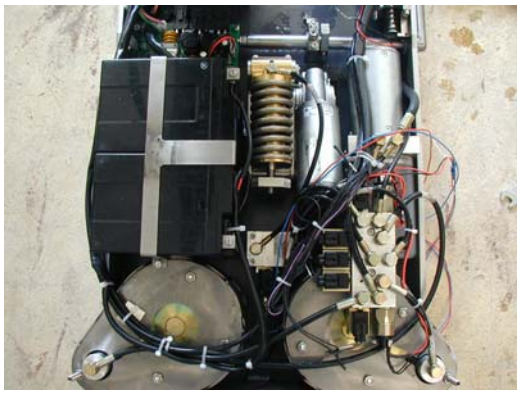

Figure 5-10 Batteries

Two 12V, 28Amp-hour sealed lead acid batteries provide the main power source for the table. The batteries are wired in series to provide 24V of power to the DC circuits.

The batteries automatically take over as the power source when AC is not connected.

Charging is automatic any time the AC mains power supply is connected to the table. The batteries cannot be overcharged: a software monitor in the charging system automatically disconnects the charging system when the batteries are fully charged or after a continuous 8 hours of charging.

Batteries have an expected service life of three years. They are field replaceable.

Battery Replacement

Do this to replace the batteries:

WARNING	***WARNING –*** *Even a "dead" battery can contain enough power to cause a serious shock or explosive spark. Always disconnect the battery charger plug at the power center before disconnecting cables.*
WARNING	***WARNING –*** *the batteries contain acid, which can cause serious burns. While the batteries are sealed, a dead battery may be damaged and may leak. Always handle batteries in a way that will prevent acid spilling on your skin or clothes.*

1. Disconnect the table from the AC Mains power source, if necessary.
2. Turn the DC power switch to the OFF position.
3. Remove the base covers.
4. Disconnect the battery charger connector from the power supply
5. Disconnect the cable from the positive terminal of the one battery

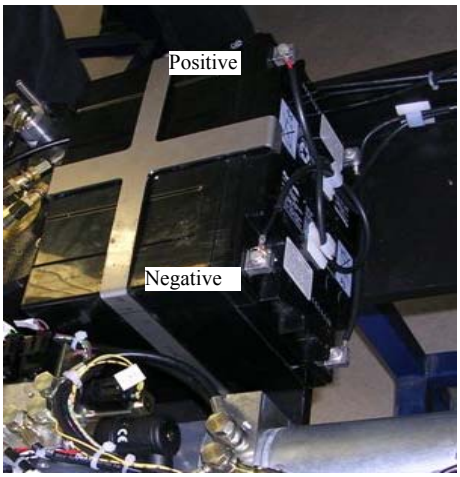

Figure 5-11 Terminal

6. Disconnect the cable from the negative terminal of left-hand battery.
7. Remove the short red jumper cable from both batteries.
8. Remove the battery retaining strap.
9. Lift each battery out of the base.
10. Reverse the procedure to install new batteries.
11. Connect table to AC Mains.

Figure 5-12 Transformer

12. Allow batteries to charge over night or for a minimum of 8 hours before operating table on battery power.

The table can be used immediately, but the AC mains power supply must remain connected until the batteries are fully charged. A full battery charge is indicated by the lighting of the green LED on the hand pendant

Power Input System

Figure 5-13 Power Supply

The power input system is made up of a power centers at the head of the table and a power supply.

Power Center

The power center contains the main DC breaker and the DC power fuses (2). It rating is 20Amps.

The 20 Amp DC circuit breaker also functions as the tables' ON/OFF switch. The DC breaker must be ON to run the table, but does not need to be on to charge the batteries. The DC breaker does not affect charging the batteries.

Fuses

Location	Fuse Rating
F1	3.15A 250V
F2	3.15A 250V

The power center contains field replaceable parts or it can be replaced as an assembly.

Power Input Center

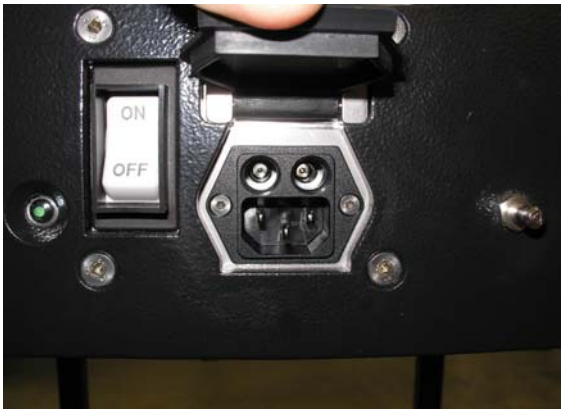

Figure 5-14 Power Input Center

The power input center contains 4 elements:

1. The AC input receptacle
2. The AC fuses (F1 and F2)
3. The charge indicator LED
4. The ground stud

The AC input line and neutral are fused with 8 Amp time delay fuses.

The charge indicator LED illuminates green when AC is applied to the table and the batteries are charging. The indicator should always be illuminated if AC is applied.

CONTROL PENDANTS

Primary Hand Pendant

Commands are entered on the primary hand pendant through the keypad.

The primary hand pendant sends commands to the CPU via connection J29 on the CPU board.

An illustration of the primary hand pendant along with function and LED display descriptions is provided in the General Information section of this manual.

If the primary hand pendant is not communicating with the CPU, the SERVICE (Service) LED will blink.

Pendant backlighting (electroluminescent panel) combined with the green Power LED indicates that the pendant is active. The Backlight will time out after a preset time period, which can be set in the service software. The backlight timer can be set to a shorter time than the Controls Wakened state. This will reduce electrical current drain on the batteries, slightly extending the battery charge cycle. The lowest backlight timer setting is 1 second.

Pressing ON while a function is running will stop the function. Pressing any other function button while a function is running will stop the articulation. To start the articulation, release the function button and press it again.

Pressing POWER while a function is running will stop the function and turn the table off.

Figure 5-15 Primary Hand Pendant

Pulling out the foot pedal activates the auxiliary pendant (shown by the flashing indicator on the primary pendant), and deactivates the primary hand pendant. Thus, if a function is pressed on the primary pendant while the auxiliary pendant is removed, primary pendant function will not work and the hydraulic pump will not run.

There are no field serviceable parts in the primary hand pendant. It must be replaced as a complete assembly.

Auxiliary Hand Pendant

The auxiliary hand pendant is a backup pendant for use in case of a primary hand pendant problem, or a power problem that disables the CPU, main electric pump and/or the primary hand pendant. It is identical to the primary hand pendant and can be used to replace the primary pendant.

The primary hand pendant sends commands to the CPU via connection J24 on the CPU board.

The auxiliary hand pendant has all the functions of the primary hand pendant with the exception of AUTO DRIVE, HI/LO, SLIDES, FLEX, REFLEX, CHAIR, UROLOGY, RETURN-TO-LEVEL, OFF, and ON. The active functions on the auxiliary pendant are back-lit.

An illustration of the auxiliary hand pendant along with functions descriptions is provided in the General Information of this manual.

The auxiliary hand pendant provides power to the solenoids as long as the selected function button is pressed and held. It does not activate the hydraulic pump.

There are no field serviceable parts in the auxiliary hand pendant. It must be replaced as a complete assembly.

WIRING

The Appendix contains drawing 86799 which identifies and locates all of the electrical wiring and electronic components, as well as the connections for each.

MECHANICAL SLIDE SYSTEM

The slide system uses a 24VDC motor to drive a timing belt which, in turn, activates a slide screw to slide the table top from head to foot. The DC motor is reversible by controlling the current direction, so no additional gearing is required to achieve bi-directional motion. The motor is secured in its mounting bracket by rubber isolators that prevent vibration transfer to the frame.

Components of the slide system were chosen for high reliability and to minimize maintenance requirements.

The motor provides high torque from a compact design to fit in the space under the table top. The motor assembles to the table top frame. The motor, drive belt, the slide gear screw, nut and its associated support bearing and mounting are field replaceable.

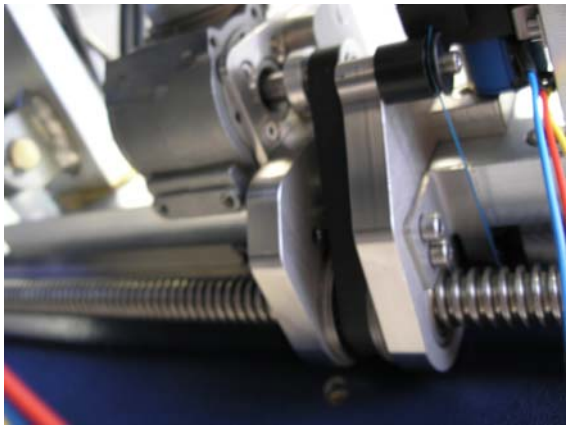

Figure 5-16 Slide Screw Drive Belt And Potentiometer Cable Routing

USING THE SERVICE PROGRAM

CONNECT TO THE TABLE

1. Connect the RS 232 data cable to your computer's COM 1 or COM 2 port.
2. Connect the other end of the data cable to the connector board on the side of the auxiliary pendant storage compartment.
3. Turn the security screws on both of the plugs until they are finger tight.
4. If necessary, connect the table to an AC mains power supply.
5. Turn the table's main DC power switch to the ON position.
6. Press the ON button on the primary hand pendant.

LAUNCH THE SERVICE PROGRAM

If you do not have the OPERON D850 Service Program installed on your laptop computer, contact Berchtold Technical Service for instructions.

Double click the service program icon on the computer's desktop. Alternatively, you can select the *OPERON D 850* program file from the start menu, and press enter.

Figure 6-1 RS232 Connection

Enter the service password, then click OK or press enter. The following will appear on your screen.

Figure 6-2 Login Form

NOTE ▶	***NOTE**: — The table must be in a controls active mode (i.e., hand pendant active) for the service program to establish an interface with the CPU.*
NOTE ▶	***NOTE**: — To interface with the MCU, the "Connect to Device" button must be selected. Alternatively, choose the COM Interface menu, Connect to device.*

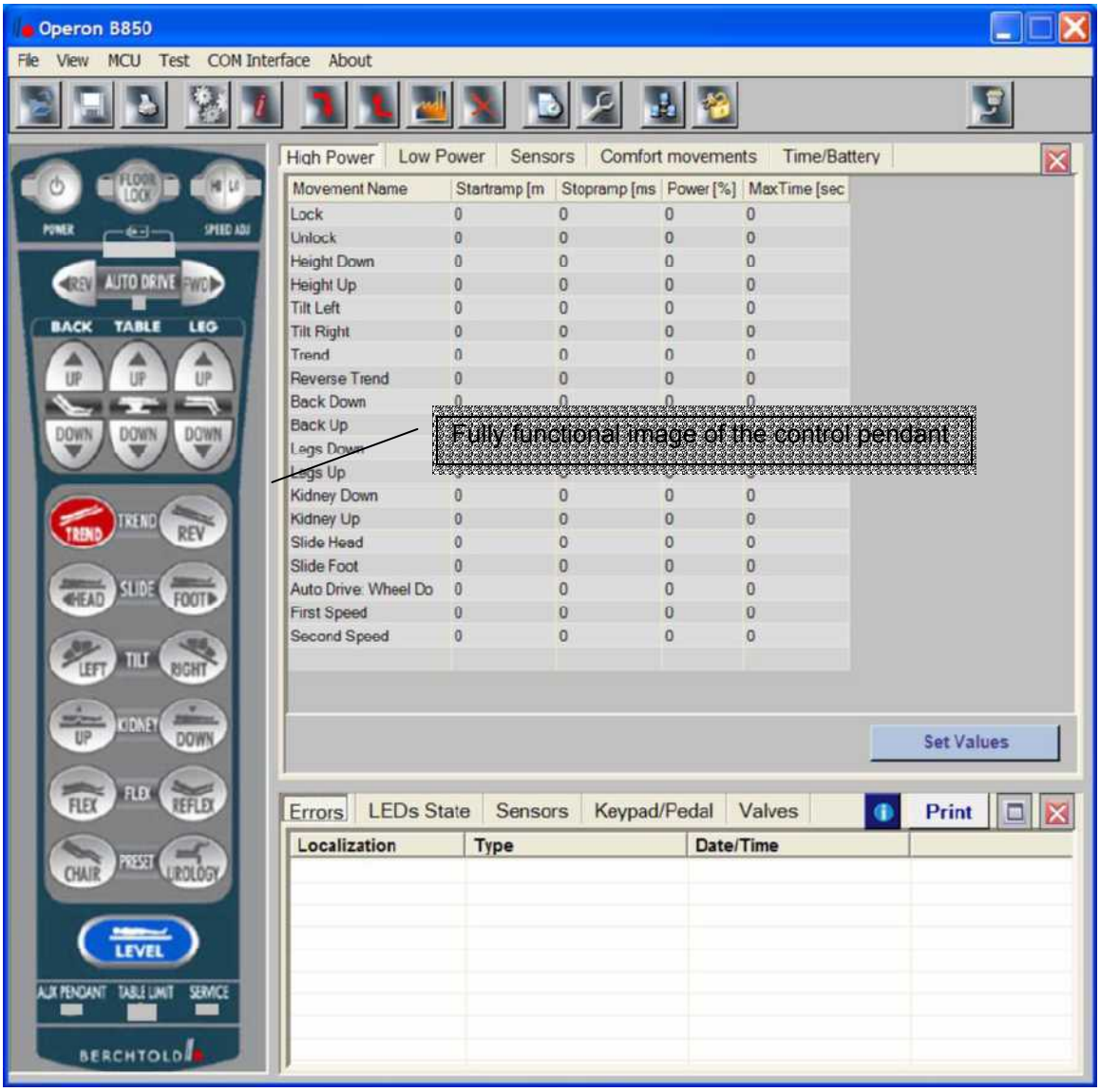

Figure 6-3 Service Program Main Menu Screen

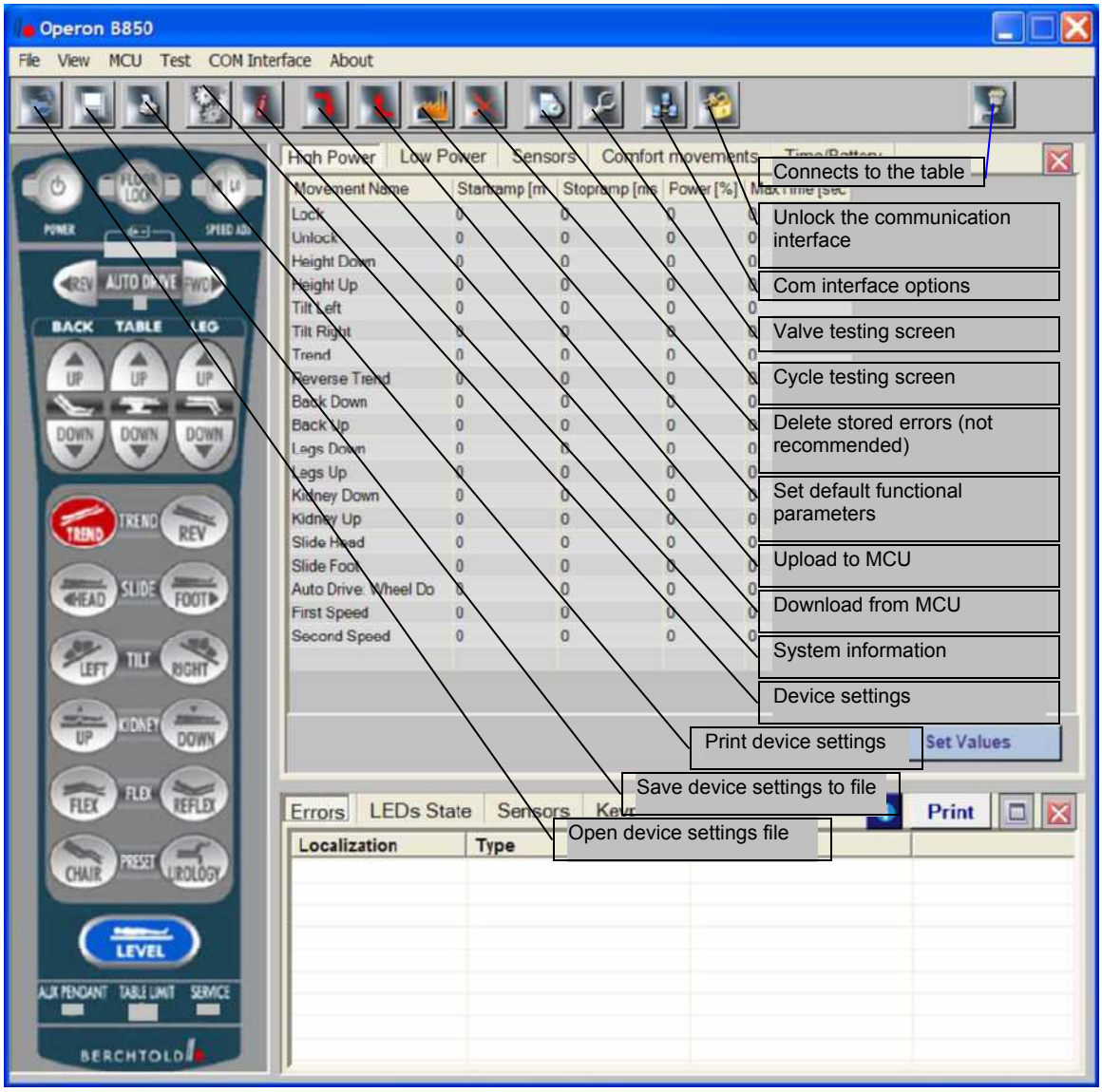

Figure 6-4 Service Program Main Menu Screen Menu Options

The hand pendant graphic and each of the menu options are explained below.

The Hand Pendant Graphic

The hand pendant graphic is a virtual hand pendant. It functions exactly the same as the real hand pendant that is physically attached to the table.

Do this to operate the graphic pendant:

1. Place your mouse pointer over any pendant button.
2. Click your left mouse button to activate the graphic button.
3. Click again to deactivate the graphic button (the table function continues until the graphic button is deactivated).

The graphic pendant serves two functions:

1. It allows you to operate all table functions from your computer while you watch the readings in the different forms.
2. If the table functions from the screen pendant button, but not from the physical pendant button, you know that the physical pendant or wiring needs to be replaced. In other words, the failure of the table to perform some function is related to a problem with the pendant or

wiring rather than a problem with the table control system.

NOTE ▶	***NOTE**: — The hand pendant automatic shutdown feature is inactivated during the time that the service program is connected. If you need to disable the hand pendant for testing purposes, use the power button on the hand pendant.*

THE SERVICE PROGRAM MENUS

The following text and graphics describe the options available to the customer or field technician on the menu bar.

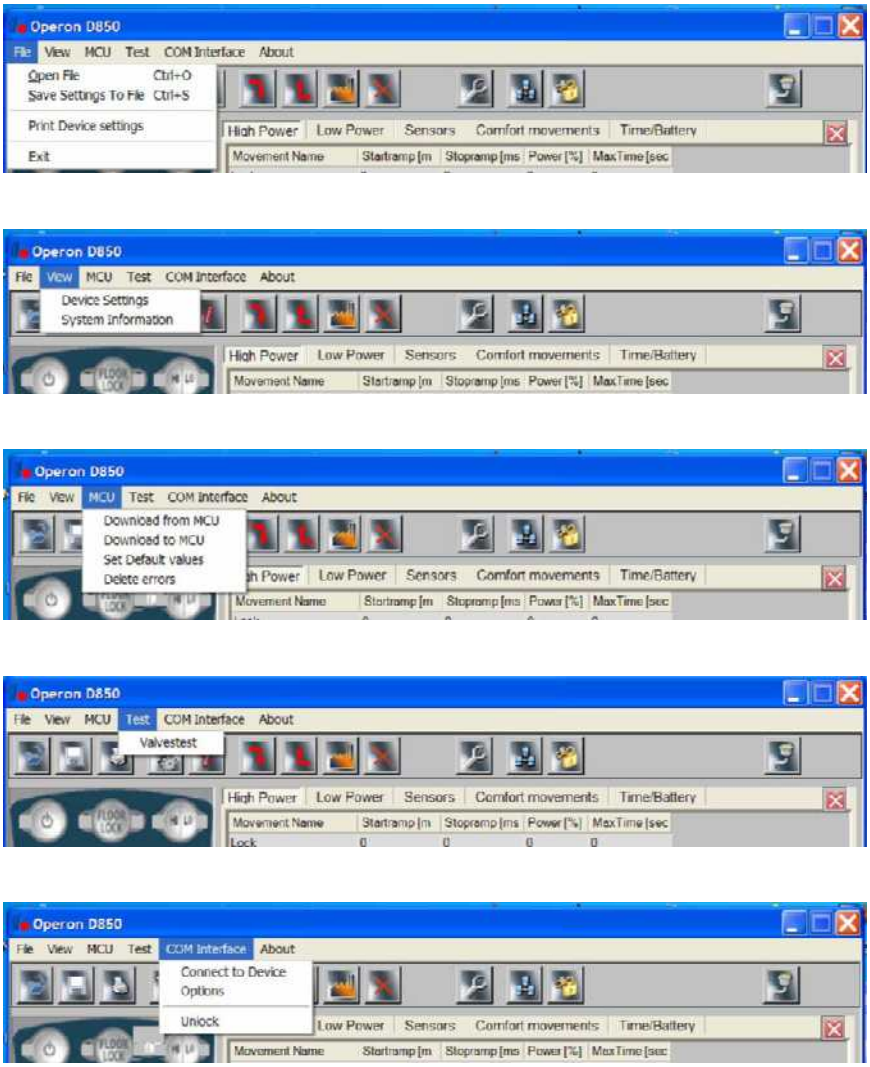

Figure 6-5 File Menu Options

NOTE	***NOTE:*** *— In order to select the menu choices with the Ctrl+ initial letter, the menu bar must be active. The menu bar is active if the top of the bar is blue. If the top of the bar is light blue, place your cursor on the bar and click.*

File Menu

The File menu offers only one choice for field service applications:

Open File

Clicking the Open File button presents a standard Windows Open File screen.

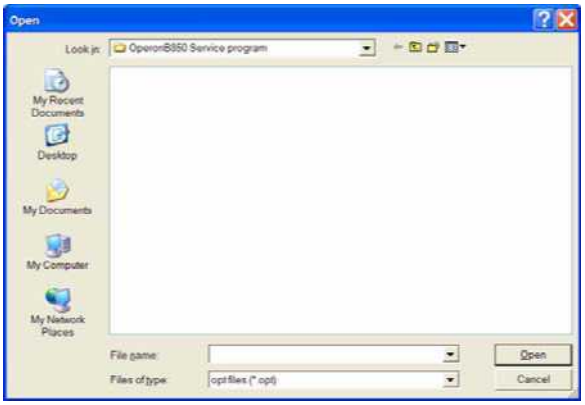

Figure 6-6 Windows File open Selection Screen

Save Settings to File Button

Clicking the Save File button presents a standard Windows File Save screen.

Figure 6-7 Save Settings to file

Print Device Settings

Selecting this option displays the standard windows print screen from which you can choose the printer you wish to use. Within this screen there are three options:

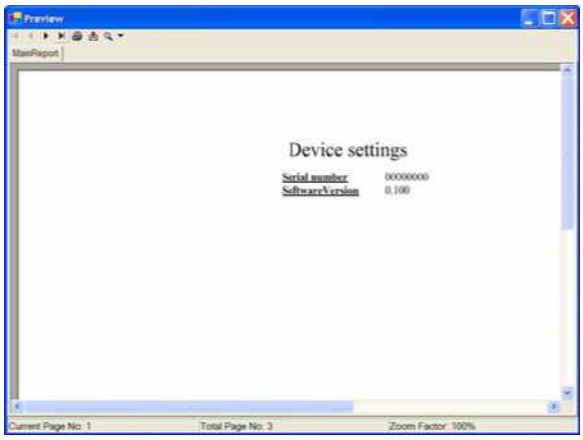

Figure 6-8 Device Settings Report

Print

Selecting this option displays the standard windows print screen from which you can choose the printer you wish to use.

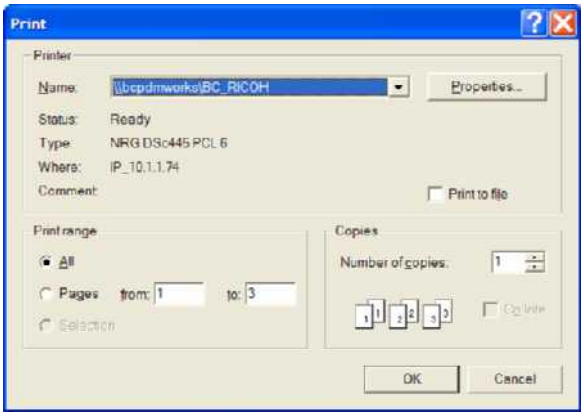

Figure 6-9 Print Report Screen

Export

Selecting this option displays the Export Report screen from which you can export the file to adobe acrobat (*.pdf), Microsoft Excel (*.xls). Microsoft Word (*.doc) or Rich Text Format (*.rtf).

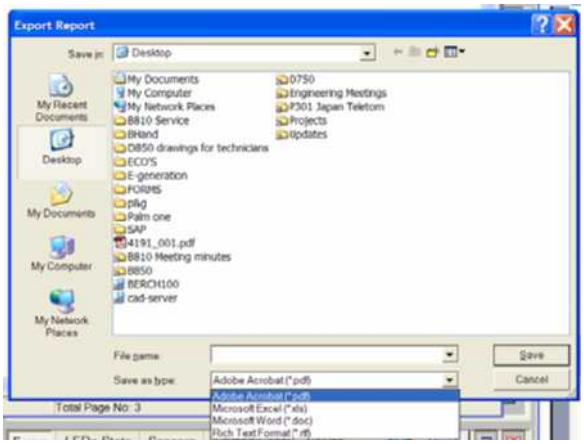

Figure 6-10 Export Report Screen

Zoom

Selecting this option displays the standard windows zoom menu.

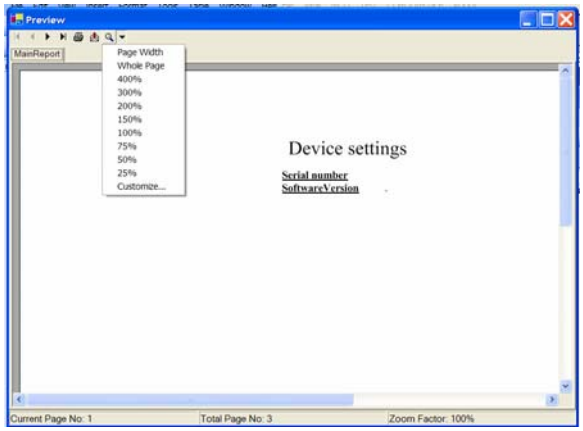

Figure 6-11 Zoom Menu

Exit

Selecting this option exits from the OPERON D850 Service Program.

- You do not receive a warning or prompt before the program shuts down.
- New settings in any form will not be automatically saved on exit. You must use the "save settings to file" command to save any new settings. You can select the exit option by clicking on the "X" box on the right corner of the menu bar.

View Menu

The View menu offers you two choices:

Device Settings

Selecting this option displays the Device Settings Screen. Clicking the Device Settings button causes the Settings Forms to appear.

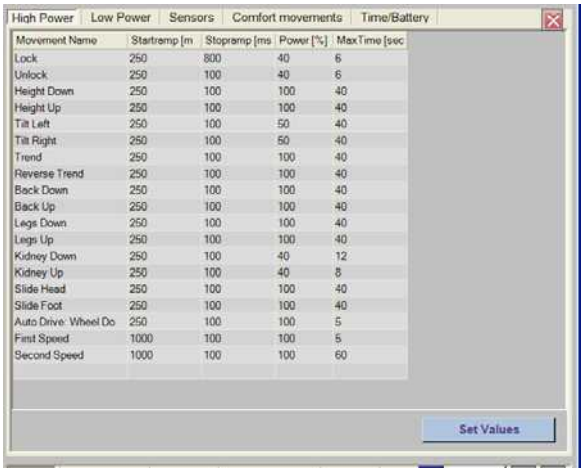
High Power
Low Power
Sensors
Comfort movements
Time/Battery
Movement Name
Startramp [m
Stopramp [ms
Power [%]
MaxTime [sec
Lock 250 800 40 6
Unlock 250 100 40 6
Height Down 250 100 100 40
Height Up 250 100 100 40
Tilt Left 250 100 50 40
Tilt Right 250 100 50 40
Trend 250 100 100 40
Reverse Trend 250 100 100 40
Back Down 250 100 100 40
Back Up 250 100 100 40
Legs Down 250 100 100 40
Legs Up 250 100 100 40
Kidney Down 250 100 40 12
Kidney Up 250 100 40 8
Slide Head 250 100 100 40
Slide Foot 250 100 100 40
Auto Drive: Wheel Do 250 100 100 5
First Speed 1000 100 100 5
Second Speed 1000 100 100 60
Set Values

Figure 6-12 Device Settings Screen

System information

Selecting this option displays the System Information Screen, from which you can read the Errors file and the status of LED indicators, sensors, pendant keypad/ footswitch pedals and valves. You may also print any of this information by selecting the Print button.

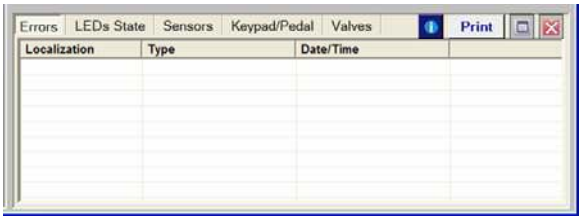

Figure 6-13 System Information Screen

Errors

Selecting this option displays the errors file screen. By clicking the "i" icon, the last 100 error codes recorded by the CPU will be displayed. Errors are displayed on a First In/First Out (FIFO) basis. If more than 100 errors are logged, each new error after the one-hundredth will result in the elimination of the oldest error in the register. After you have dealt with all of the codes, you can press the Clear Error button on the top bar of the System Info window to clear the codes. Clearing the codes only clears them from the table's CPU memory. The error codes remain in the Service Program's

database as a part of the table's history. This list can be sorted by Localization (code for where the error occurred), type of error and date/time of the error. This is a great aid for troubleshooting.

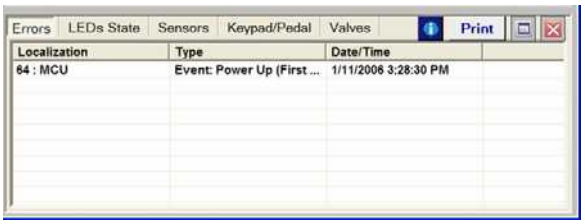

Figure 6-14 Errors Information Screen

LEDs State

Selecting this option displays the LEDs State screen. By clicking the "i" icon, the system will read the current status of the LEDs on the pendants and base. This list can be sorted by LED Name and State (on or off).

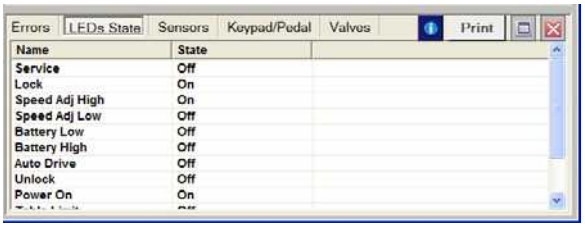

Figure 6-15 LEDs State Information Screen

Sensors

Selecting this option displays the Sensors information screen. By clicking the "i" icon, the system will read the current status (V= volts DC) of all of the sensors in the D850 system. This list can be sorted by Sensor Name and State (sensed voltage). You will get a report on the voltage or amperage readings of all sensors in the list below.

- Tilt (V)
- Trend (V)
- Back-X (V)
- Back-Y (V)
- LegL-X (V)
- LegL-Y (V)
- LegR-X (V)
- LegR-Y (V)
- HS-Back (V)
- HS LegL (V)
- HS LegR (V)
- Kidney (V)
- Slide (V)
- Height (V)
- Lock PS1 (V)
- Lock PS2 (V)
- ACCU state (V)
- AC Line (V)
- U24V sense (V)
- I-sense (A)
- 5V state (V)
- 7V state (V)

At the end of the report, the current position of all sensors is shown, converted to degrees or millimeters as appropriate.

The Back and Leg sensors are accelerometers with two reference axes, X and Y. The X axes are the only ones needed for troubleshooting. The Y axis information is always near the extreme (0 or 5VDC) due to the orientation of the sensors.

The Back and Leg sections have Hall Sensors (HS) built in to sense if a section is attached.

Figure 6-16 Sensors Information Screen

Keypad/Pedal

Selecting this option displays the Keypad/Pedal information screen. By clicking the "i" icon, the system will read the current status of all of the control switches in the D850 system. Any switch which is closed will be displayed. Two keys on the hand pendant may be pressed simultaneously (thus the first key and second key categories). You can use this function to test the pendant's or foot switch's performance.

Figure 6-17 Keypad/Pedal Information Screen

Valves

Selecting this option displays the Valves information screen. By clicking the "i" icon, the system will read the current status of all of the valves in the D850 hydraulic system. This list can be sorted by valve Name and State (Open Load means the switch is open).

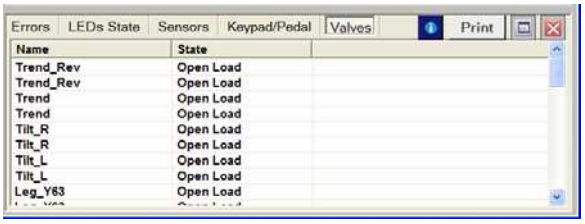

Figure 6-18 Valves Information Screen

MCU Menu

The MCU menu offer you four choices

1. Download from MCU

   Selecting this option downloads all settings from the table to the service computer.

2. Download to MCU

   Selecting this option uploads all settings to the table from the service computer. This is the same as selecting the Set Values button on the device settings screens.

3. Set default values

   Selecting this option uploads the default file settings to the table.

4. Delete errors (NOT RECOMMENDED)

   Selecting this option deletes all errors accumulated in the table.

Test Menu

The Test menu offers only one option:

1. Valves Test

   Selecting this option displays the Valves Test Screen. This screen allows the user to activate motors and switches to aid in troubleshooting a problem. For instance, to operate the floor lock cylinders without the hand pendant (and without the associated signal delays and voltage ramps), one would select the Hydraulic Motor box, the 24VP box and the Lock_Y71 and Lock_Y72 boxes. Then input the power in percent (Power Width Modulation [PWM] percentage) and click RUN. Click RUN again to stop.

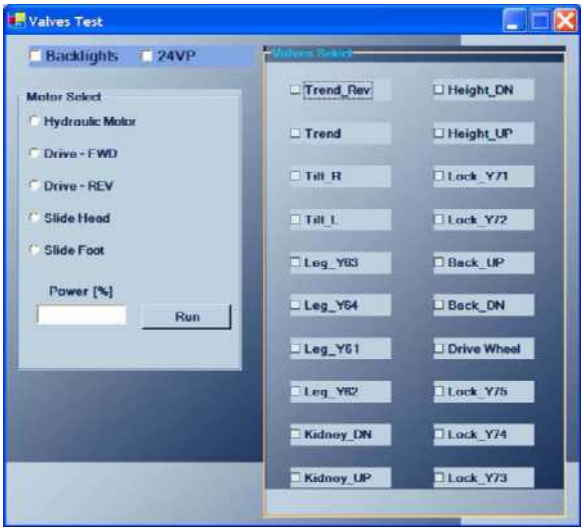

Figure 6-19 Valves Test Screen

COM Interface Menu

This menu offers three choices

1. Connect to device

   Selection this option initiates communication between the table MCU and the service computer and downloads all of the settings of the table to be displayed via the service program.

2. Options

   Selecting this option displays the COM Options setting form.

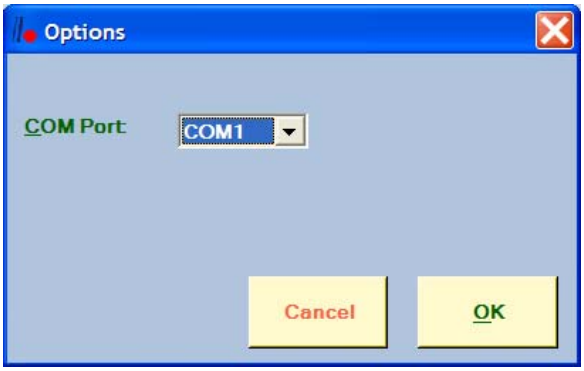

Figure 6-20 COM Options Screen

The communications settings between your computer and the table's CPU will be set automatically during the Connect to Device process. You may only change the COM port.

- Click on the COM Port you wish to use: COM 1 or COM 2.
- If you change your mind on any setting, go back and modify it.
- If you decide to leave the settings as they are, click on the "Cancel" button. Alternatively, you can click on the "X" button in the upper right corner. Either of these actions will close the form.
- Once you have the settings the way you want them, click on "OK" to save them, and exit the COM Options form.

Unlock

This option prompts the user for a "Key-Code" for virtual control of table functions.

Figure 6-21 COM Unlock Screen

This is a purchased feature; please see your BERCHTOLD Corporation Sales/Service Representative.

About Menu

This option displays the software version, the service program version, and the serial number of the table.

Buttons

All of the buttons along the top of the screen are associated with corresponding menu options described above.

- Clicking the File Open button causes the File Open screen to appear. This window can be exited by clicking the X in the upper right hand corner.
- Clicking the Print Device Settings button causes the Device settings report to be compiled and displayed. This window can be exited by clicking the X in the upper right hand corner.
- Clicking the Device Settings button causes the Device Settings screen to appear. This window can be exited by clicking the X in the upper right hand corner.
- Clicking the System Information button causes the System information screen to appear. This window can be exited by clicking the X in the upper right hand corner.
- Clicking the Download from MCU button downloads all settings from the table to the service computer.
- Clicking the Upload to MCU button uploads all settings to the table from the service computer.
- Clicking the Set Default Values button uploads the default file settings to the table.
- Clicking the Delete Errors button deletes all errors stored in the MCU. This is not recommended.
- Clicking the Valves Test button causes the Valves Test Screen to appear.
- Clicking the COM Interface button causes the COM Options setting form to appear
- Clicking the Unlock COM Interface button causes the Unlock COM interface dialog box to appear.
- Clicking the Open File button presents a standard Windows Open File screen.
- Clicking the Save File Settings button presents a standard Windows File Save screen.
- Clicking the Print Device Settings button compiles all of the device settings into a report preview, which can be printed, exported, or viewed.

Device Settings Screen

The Settings Forms are organized on five tabs:

1. High Power

2. Low power
3. Sensors
4. Comfort Movements
5. Time/Battery

To display the parameters for the function you wish to change, click on the tab to bring it forward and make it active.

NOTE	***NOTE:*** *— The values shown in the illustration may not match those for your table.*

High Power Tab

The High Power tab allows you to set speed at which the table will perform the various movements in High Power mode of the MicroMove™ feature. It is important to note that you can set opposing actions to operate at different speeds. Thus, for example, height up can be set to move rapidly, while height down can be set to move slowly.

The following parameters can be set for each movement:

Startramp (msec)

- This value is the amount of time (in milliseconds) it takes from the time the operator pushes a hand pendant button until the motor reaches full power setting. In effect, it is a ramp up time to achieve a smooth start to the motion. The startramp time should not be set above 1000 msec.

Stopramp (msec)

- This value is the amount of time (in milliseconds) it takes from the time the operator releases a hand pendant button until the motor reaches 0V power. In effect, it is a ramp down time to achieve a smooth stopping motion. The stop ramp time should not be set above 1000 msec.

Power (%)

- This is the percentage of motor's power used during the movement. The amount of power applied equates directly to the speed with which the motion is performed. Power may be set between 20 and 100% of the motor's full power.

Max. Time (sec)

- This is the maximum amount of time (in seconds) the table is allowed to try to perform the movement. If the movement is not complete at the end of the time period, the motor shuts off.

CAUTION	***CAUTION —****The Service Program will allow you to set motor parameters to the min. and max. values of 100 to 1000. Setting the parameters to the extreme min. or max. value could lead to damage to the table or its components, including a failure to operate. Always test your settings to ensure that the table responds as anticipated.*

To set the value of the parameter, use your cursor to highlight the number you wish to change. Type in the new value to replace the old value.

After setting all of the parameters to the desired levels, click on the "Save Values" button to record them in the table's CPU.

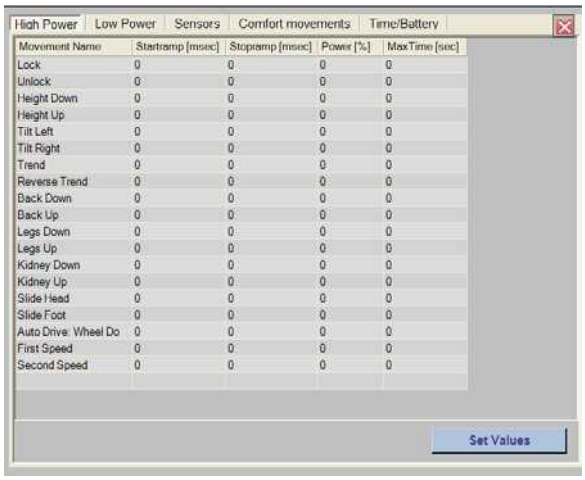

Figure 6-22 High Power Settings Screen

Low Power Tab

The Low Power tab allows you to set speed at which the table will perform the various movements in Low Power mode of the MicroMove™ feature. The speeds set in this form are by default significantly slower than the High power settings, and are intended to give the user fine adjustment control of the patient's position.

All of the settings parameters are identical to the High Power settings.

Sensor Tab

NOTE ▶	***NOTE:*** *— The Sensor tab is disabled for the Technical Service password.*

The sensor tab allows you to set the parameters for the following sensors:

- Tilt
- Trendelenburg
- Back
- Leg Left
- Leg Right
- Slide
- Height

The sensor for kidney bridge position is an optical switch which requires no settings or adjustments.

CAUTION	***CAUTION*** *—The Service Program will allow you to set sensor parameters outside the min and max range shown in 4. This could lead to damage to the table or its components, including a failure to operate. Always double check your settings before clicking on "Save Parameters".*

Do this to set the parameters:

1. Click on the button for the function you wish to set. The name of the function will appear in the title box in the listing
2. Use your cursor to highlight the number you wish to change.
3. Type in the new value to replace the old value.

Slide and height parameters are measured in millimeters of movement.

Do this to set the zero position:

1. Level the section using the pendant controls and an accurate level.
2. Click in the "Zero Offset" window on the Sensors Tab.
3. Read the Status window of the sensor. If the Status reading is not zero, enter a number of equal values but opposite sign in the Zero offset window (i.e. if Status reads 1.5°, enter -1.5°).
4. Slide and height have large offsets due to the length of the cable on the potentiometer. The offset indicates the approximate voltage when ½ of the cable is extended from the potentiometer, not necessarily the mid point of the movement.

TABLE 6-1 SENSOR PARAMETERS

Name	Max.	Min.	Zero Offset
Tilt	20	-20	0
Trend	30	-31	0
Back	90	-45	-5
LegL	30	-105	0
LegR	30	-105	0
Slide	183	-232	-260
Height	335	-266	-367

After setting all of values for the parameter to the desired levels, click on the "Set Values" button to record them in the table's MCU.

The Status window on the tab shows the current value of the section in degrees or millimeters. Thus, if the table is tilted slightly to the right (positive tilt) the angle will read slightly higher than the zero position value. Similarly, if the table is tilted slightly to the left (negative tilt) the voltage will read slightly lower than the zero position value.

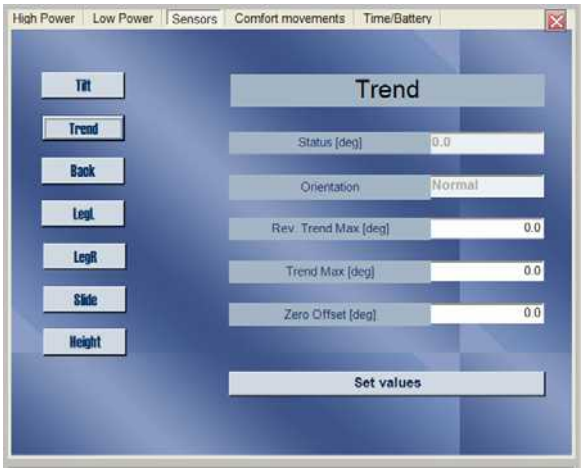

Figure 6-23 Sensor Setting Screen

Comfort Movements Tab

The Comfort Movements tab lets you select how the table moves in response to the Level, Flex, Reflex, Chair and Urology buttons on the hand pendant.

The amount of movement for each articulation is preset in one degree increments from 1° to 20°. This value is preset at the factory, but may be adjusted using the Technician level password.

Holding the desired hand pendant button moves the table sections in x-degree increments. After the final section in the articulation has moved x degrees, the first section will move an additional x degrees, etc.

For example, if you have the Flex Motion parameters set to 5 degrees and hold the Flex button:

- The back will lower 5 degrees (Trendelenburg) and stop.
- The seat will lower (reverse Trendelenburg) 5 degrees and stop.
- The legs will lower (reverse Trendelenburg) 5 degrees and stop.
- The back will lower an additional 5 degrees (Trendelenburg) and stop.
- The seat will lower an additional 5 degrees (reverse Trendelenburg) and stop.
- The leg section will lower 5 degrees (reverse Trendelenburg) and stop.
- Etc.

If you release the button before the articulation has reached its limit, then push and hold the button again, the motion will begin again with the first movement (it will not continue where it left off) until it reaches the sequence limit. Do this to set the movements parameters:

1. Click on the drop down arrow to the right of the "Movements Stop" window.
   - A drop down menu will appear

3. Click on one of the choices to select it.
   - The choice selected will appear in the window next to the drop down arrow.
4. Click on the "Set Values" button to save your selections.

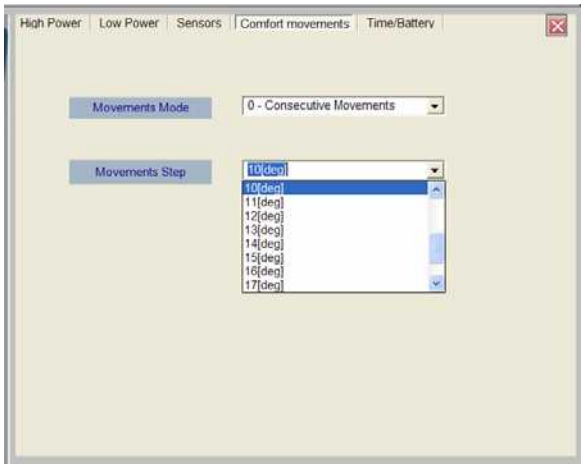

Figure 6-24 Comfort Movements Screen

Time/Battery Tab

The Time/Battery tab sets the battery power indicator display for the hand pendant. These are the voltage readings that cause the LED display to change from one level to the next higher level as the battery accumulates a charge. The voltages should be set toward the upper end of the range to ensure that the table has adequate time to charge before being unplugged from the AC mains.

NOTE ▶	***NOTE:*** *— The battery voltages are disabled for the Technical Service password.*

To set the value of the parameter, use your cursor to highlight the number you wish to change. Type in the new value to replace the old value.

The Status window on the tab shows the current battery charge level in VDC. This is a display values based on CPU readings and cannot be changed in the field.

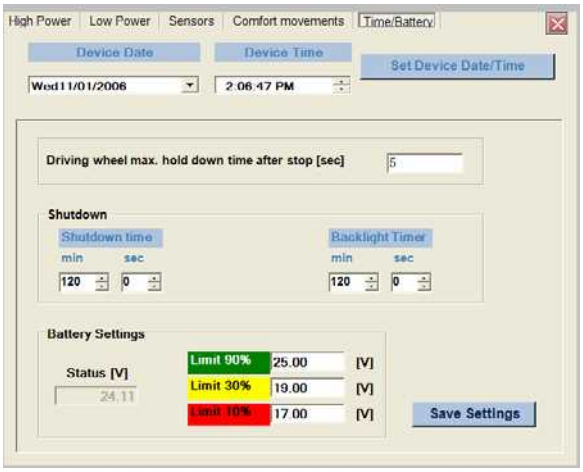

Figure 6-25 Shutdown Screen

The shut down time adjustment sets the sleep time delay: how long after the last use until the hand pendant enters "sleep" mode. In sleep mode, the back lighting goes out and all LEDs turn off. The longer the table remains in "sleep" mode, the longer the battery charge will last.

User preference should be the primary consideration for the sleep time delay setting. Generally, procedures which require more frequent table position changes should have longer sleep time delays. Procedures that require infrequent position changes can have shorter sleep time delays.

The backlight time adjustment sets the sleep time delay for the backlight only: how long after the last use until the backlight enters "sleep" mode. In sleep mode, the back lighting goes out, but the controls may be active. The longer the backlight remains in "sleep" mode, the longer the battery charge will last, although the effect is minimal.

To set the sleep time delay, click and hold the left mouse button as you drag the pointer to the desired setting. Time increments are in full minutes.

After setting all of the parameters to the desired levels, click on the "Save Settings" button to record them in the tables CPU.

Name	Default
Limit 10% (LED changes from Steady Red to Flashing Red)	21.4V
Limit 30% (LED changes from Flashing Red to Yellow)	22.7V
Limit 90% (LED changes from Yellow to Green)	23.5V
Sleep timer	90 minutes

TABLE 6-2 BATTERY SETTING PARAMETERS

About Tab

The information on this tab is display only. It cannot be changed by the technician in the field. The "Set serial number" button on this form is not active. The Device model describes what model the table is. "Standard + AutoDrive" means that the InstaDrive™ feature is installed. Software version refers to the version of software (or firmware) installed on the MCU of the table. Service program version is the version of Service Software you are using to communicate with the table (installed on the service computer). Serial number is set by the factory and cannot be changed.

Figure 6-26 About Information Screen

Software Commands with Primary Pendant

The level position of the table can be set using the primary hand pendant. Here is the sequence:

1. Articulate the table section s to the desired level position.
2. Turn the table off at the breaker switch (base).

3. Hold the Level and On/Off buttons on the hand pendant simultaneously.
4. Turn the table on at the breaker switch (base) while holding the other two buttons on the pendant.
5. When the service light on the pendant flashes multiple times, the pendant buttons can be released. A new level position has been set.

The hydraulic leg cylinders operate in series. In the event that the leg cylinders were to no longer be aligned, a software command can be given through the primary hand pendant to compensate for uneven leg cylinders. Here is the sequence:

1. Turn the table off at the breaker switch (base).
2. Hold the leg up and the Level buttons on the hand pendant simultaneously.
3. Turn the table on at the breaker switch (base) while holding the other two buttons on the pendant.
4. When the service light on the pendant flashes multiple times, the pendant buttons can be released. The leg cylinders automatically drive upward to their mechanical limit and re-align.

CPU Error Codes

The CPU is programmed to store error codes for a series of specific errors. These are numbered from 1 to 64. 0 shows a listing of these codes and their causes. The error code table also includes potential solutions to eliminate many of the errors.

For errors where no solutions are suggested, you can use the error name and description to determine additional diagnostic steps that can be used to discover the problem and return the table to service. A Troubleshooting Guide follows the Error Code listing.

TABLE 6-3 OPERON B850 ERROR CODES

Error Code	Type	Description	Solution
1: MCU	1 : Program memory checksum error	Microcontroller problem	Replace the CPU
2 : MCU	1 : RAM memory fault	Microcontroller problem	Replace the CPU
3 : MCU	1 : EEPROM fault	Microcontroller problem	Replace the CPU
4 : MCU	1 : Real_Time_Clock fault	Problem with RTC chip U21	Replace the CPU
6 : MCU	1 : Internal Error 1 (Program Logic Control)	Microcontroller problem	Replace the CPU
7 : MCU	1 : Internal Error 2 (Program Logic Control)	Microcontroller problem	Replace the CPU
8 : MCU	1 : Internal Error 3 (Program Logic Control)	Microcontroller problem	Replace the CPU
9 : MCU	1 : Internal Error 4 (Program Logic Control)	Microcontroller problem	Replace the CPU
10 : MCU	1 : Internal Error 5 (Program Logic Control)	Microcontroller problem	Replace the CPU
14 : MCU	1 : ACCU fault (disconnected)	1 - Battery is not connected	Reconnect battery or replace battery
		2 - Problem in sensing circuit (PCB components or connecting cable)	Replace wiring or replace CPU
18 : MCU	1 : 24V fault	1 - No connection between CPU PCB and power sypply	Replace wiring
		2 - Short cut in drivers for valves and motors	Replace the CPU
		3 - U1 problems in driving curcuit	Replace the CPU
		4 - Damaged switch U1	Replace the CPU

Error Code	Type	Description	Solution
19 : MCU	1 : 7,5VP fault	1 - Shortcut in 7,5VP circuit	Replace the CPU
		2 - Damaged U2 or Q3. Impossible to run 7,5VP	Replace the CPU
20 : MCU	1 : 5VP fault	1 - Shortcut in 5VP circuit	Replace the CPU
		2 - Damaged U4 or problem in 7,5VP circuit	Replace the CPU
58 : MCU	1 : Event: Communication command "Reset"		This is not an error, no action required
59 : MCU	1 : RESET instruction has been executed	MCU self restart	This is not an error, no action required
60 : MCU	1 : unexpected WDT timeout	Microcontroller problem	Run table through all functions to ensure proper operation. If functions fail to operate as expected, replace the CPU
61 : MCU	1 : unexpected Brown-out-reset	MCU low power supply	Charge battery or replace power supply
62 : MCU	1 : Stack overflow/underflow	Microcontroller problem	Replace the CPU
63 : MCU	1 : Undefined reset condition	Event after programming and disconnecting the programmer.	This is not an error, no action required
64 : MCU	1 : Event: Power Up (First time ON)		This is not an error, no action required
0-31 : Sensor : (Name of sensor)	2 : fault	1 - No 5VP	Check wiring or replace the CPU
		2 - Problem with wiring	Check wiring
		3 - Shortcut	Check wiring
		4 - Damaged sensor	Replace sensor
		5 - Problem with ADC (CPU PCB)	Replace the CPU
0-31 Valve : (Valve name)	4 : Disconnected line	1 - Problem with wiring	Check wiring
		2 - Damaged CPU PCB	Replace the CPU
		3 - Damaged valve	Replace valve
0-31 Valve : (Valve name)	5 : Overload	1 - Problem with cable	Check wiring
		2 - Damaged CPU PCB	Replace the CPU
		3 - Damaged valve	Replace valve
0-31 Valve : (Valve name)	6 : Short circuit to ground	1 - Problem with cable	Check wiring
		2 - Damaged CPU PCB	Replace the CPU
		3 - Damaged valve	Replace valve
1-3 (Motor name)	7 : Disconnected line	1 - Problem with wiring	Check wiring
		2 - Shortcut in driving circuit	Check wiring or replace the CPU
		3 - Problem in sensing circuit	Replace the CPU
		4 - Damaged motor	Replace motor

Error Code	Type	Description	Solution
1-3 (Motor name)	8 : Overload	1 - Problem with wiring	Check wiring
		2 - Shortcut in driving circuit	Check wiring or replace the CPU
		3 - Problem in sensing circuit	Replace the CPU
		4 - Damaged motor	Replace motor
1-42 : Keypad or pedal	9 : fault	1 - Cable problem	Check wiring or replace hand pendant / foot pedal
		2 - Button stuck	Replace hand pendant / foot pedal
		3 - Bad contact among PCBs	Replace the CPU

SERVICE AND PARTS MANUAL PUBLICATION HISTORY

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